DOCUMENT RESUME

ED 229 244 SE 041 445

TITLE	Energy Adventure Center. Activity Book. Revised [and Expanded] Edition.
INSTITUTION	Wichita Unified School District 259, Kans.
SPONS AGENCY	Kansas State Dept. of Education, Topeka.
PUB DATE	83
NOTE	425p.; For earlier edition, see ED 222 352.
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF01/PC17 Plus Postage.
DESCRIPTORS	Climate Control; *Conservation Education; Decision Making; Elementary Secondary Education; *Energy; *Energy Conservation; Environmental Education; Heating; Instructional Films; *Learning Activities; *Manufacturing; Power Technology; *Solar Energy
IDENTIFIERS	*Energy Education

ABSTRACT

A variety of energy activities are provided, including instructions for and questions related to energy films. The activities are organized into five sections. Section 1 (work) includes an activity focusing on movement and change. Section 2 (forms of energy) includes activities related to mechanical (movement), radiant (light), chemical (burning), electrical, nuclear, thermal (heat), and sound energy, and energy conversions. Section 3 (resources and energy) includes activities related to renewable/non-renewable resources, and development of resources (considered origins, equipment, uses, environmental impact, and economic impact). Section 4 includes activities focusing on society and energy, addressing energy use (energy use eras and present patterns), power and politics (international, national, and local), and the future of energy. Section 5 provides activities related to the individual and energy. Topics/concepts considered include practical applications in manufacturing, heating/cooling, and transportation; and making energy decisions (obtaining facts, information, data, exploring options, evaluating, and action planning). (JN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED229244

SE041445

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

ENERGY ADVENTURE CENTER

ACTIVITY BOOK

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
N. Flott
____
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

WICHITA PUBLIC SCHOOLS
UNIFIED SCHOOL DISTRICT 259
Dr. Alvin E. Morris, Superintendent

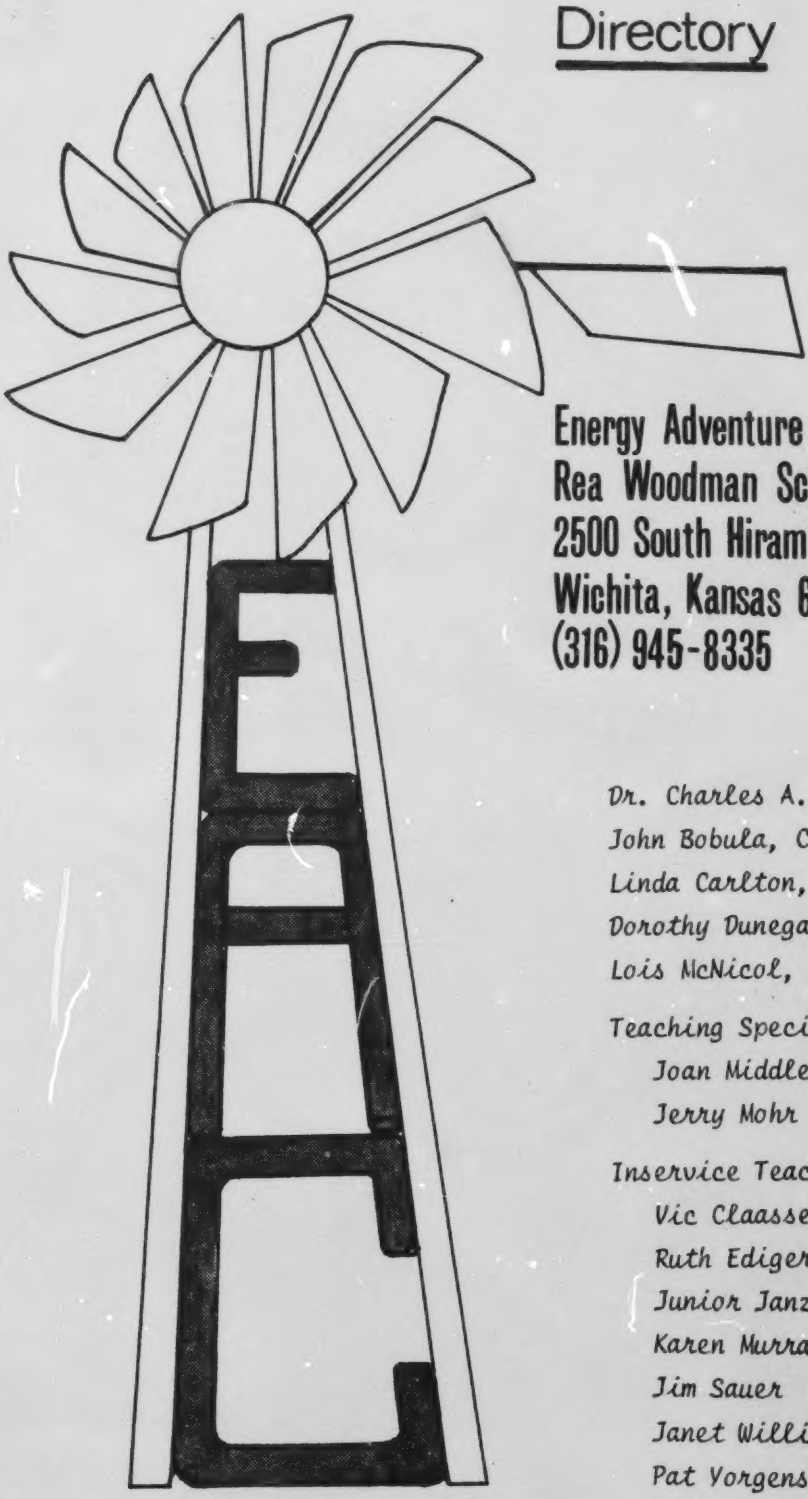
Dr. Lawrence A. Bechtold, Director
Curriculum Services Division

Linda L. Carlton, Coordinator
Energy Adventure Center

The Energy Adventure Center is funded by a Title IV-C ESEA grant from the Kansas Department of Education. This notebook, or parts thereof, may be used or reproduced in any manner, in any quantity for educational purposes as long as credit is given to the Energy Adventure Center as the source of the material.

Revised edition 5-25-83

Directory



Energy Adventure Center
Rea Woodman School
2500 South Hiram
Wichita, Kansas 67217
(316) 945-8335

Dr. Charles A. Thompson, Co-Director
John Bobula, Co-Director
Linda Carlton, Coordinator
Dorothy Dunegan, Technical Assistant
Lois McNicol, Clerk

Teaching Specialists:
- Joan Middlemast
- Jerry Mohr

Inservice Teachers:
- Vic Claassen
- Ruth Ediger
- Junior Janzen
- Karen Murray
- Jim Sauer
- Janet Williams
- Pat Yorgensen

OUTLINE OF EAC PROGRAM OBJECTIVES

I. **Work**
- A. Movement
- B Change

II. **Forms of ENERGY**
- A. Recognize
  - 1. Mechanical (movement)
  - 2. Radiant (light)
  - 3. Chemical (burning)
  - 4. Electrical
  - 5. Nuclear
  - 6. Thermal (heat)
  - 7. Sound
- B. Forms can be converted

III. **Resources and ENERGY**
- A. Types of resources
  - 1. Non-renewable
  - 2. Renewable
- B. Development of resources
  - 1. Origin
  - 2. Equipment
  - 3. Uses
  - 4. Environmental impact
  - 5. Economic impact

IV. **Society and ENERGY**
- A. Energy use
  - 1. Energy use eras
  - 2. Present patterns
- B. Power and politics
  - 1. International
  - 2. National
  - 3. Local
- C. Energy future
  - 1. Hard
  - 2. Soft

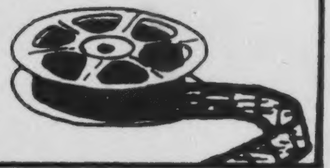
V. **Individual and ENERGY**
- A. Practical applications
  - 1. Manufacturing
  - 2. Heating/Cooling
  - 3. Transportation
- B. Energy decisions
  - 1. Obtain facts, information, data
  - 2. Explore options
  - 3. Evaluate
  - 4. Plan action

EAC

PRESENTS

ENERGY: A DILEMMA

No. 1171 20 min.
J. S. 1973



Instructions:

This film will help the students:

1. Obtain information on our exponentially growing use of energy.
2. Obtain information on the extent of the supply of fossil fuels, how long they will last at our increasing rate of use, and the environmental costs of extracting them.
3. Understand some of the problems associated with using energy from alternative sources, primarily nuclear.
4. Understand that our energy use is on a collision course with energy supply, a circumstance that will change our lives in the not too distant future.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

The Energy Connection

This animated film depicts the use of energy from early times up through the present and considers prospects for the future. It presents factual information but also deals with values and attitudes.

In simple terms, man has always used energy to do his work. Through ingenuity and resourcefulness he has progressed from simple muscle power to the use of natural resources and complex machinery to do his work. He has found that with the increase of technology have come the decrease of natural resources and the despoiling of the environment. The basis of our economic system has been the use of energy. Our first wants were rather simple, but we've always wanted more. Businesses have expanded and profits have risen, but at the expense of the environment through abuse and misuse.

We are now facing some complex problems. The viewers are asked what we have to change to solve these problems. The answer is us. It is suggested that we:

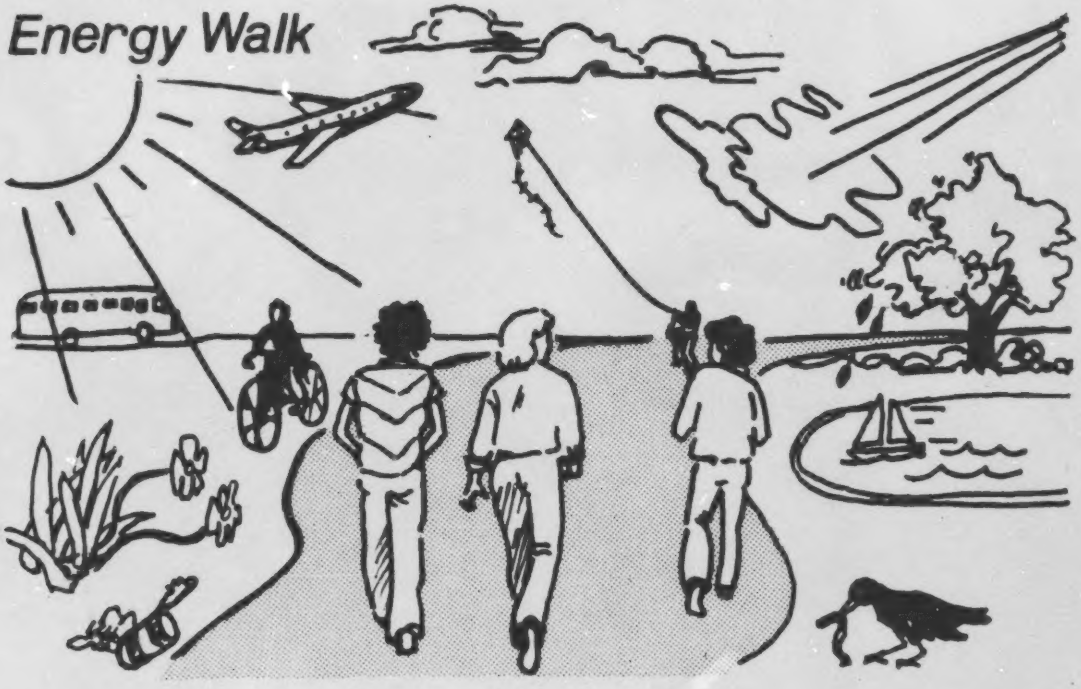
1. reevaluate our products and our use of resources.
2. differentiate our needs from our wants and understand the part that advertising plays in making us want more.
3. be aware of the fact that the more goods we produce, the more resources we use and the more pollution we cause.

Just changing us sounds like a fairly simple solution, until we face another issue. What are some of the economic consequences if we cut back on production?

The prospects for the future appear at first to be rather gloomy, but as the film progresses, a more optimistic (but guarded) view is presented. Ideas for conserving energy, prospects of new technologies and resulting new jobs, and examples of pleasant lifestyles are considered.

Work

Energy Walk



Instructions:

Energy is all around us -- all we have to do is become aware of it. Energy is the ability to do work. We know energy is at work if something moves or changes. Take a walk to find energy. Students may walk along noting movement and/or changes in matter. Have them write down some examples. Afterwards they could share their findings with the whole group.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

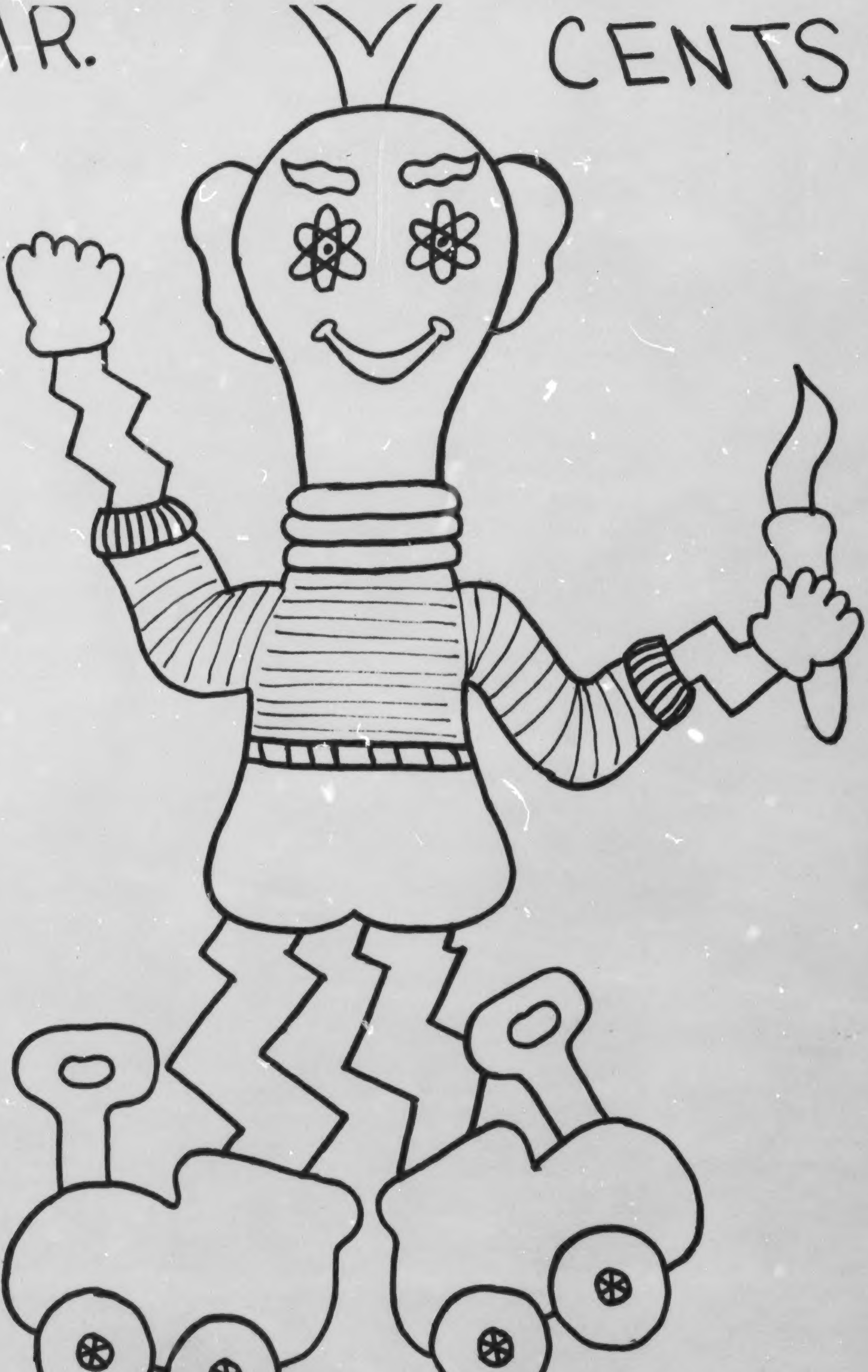
3. What resources are being used?

4. What changes could this activity mean for society?

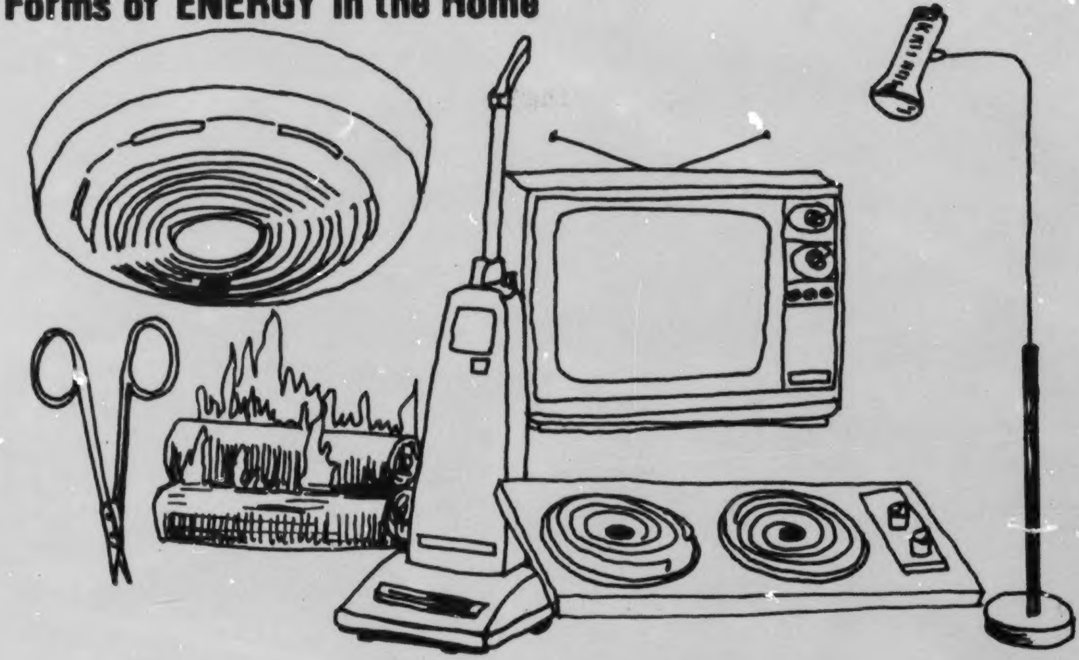
5. How could this activity change the individual's use of energy?

Forms of Energy

MR. CENTS



Forms of ENERGY in the Home



Instructions:

There are seven forms of energy: mechanical, radiant, chemical, electrical, nuclear, thermal, and sound. Students find things in their homes that they can associate with these forms of energy. The word "associate" is used here as a general term. There will be certain things that can be classified as more than one form. For instance, a television might be an example of electrical, radiant, or sound energy.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

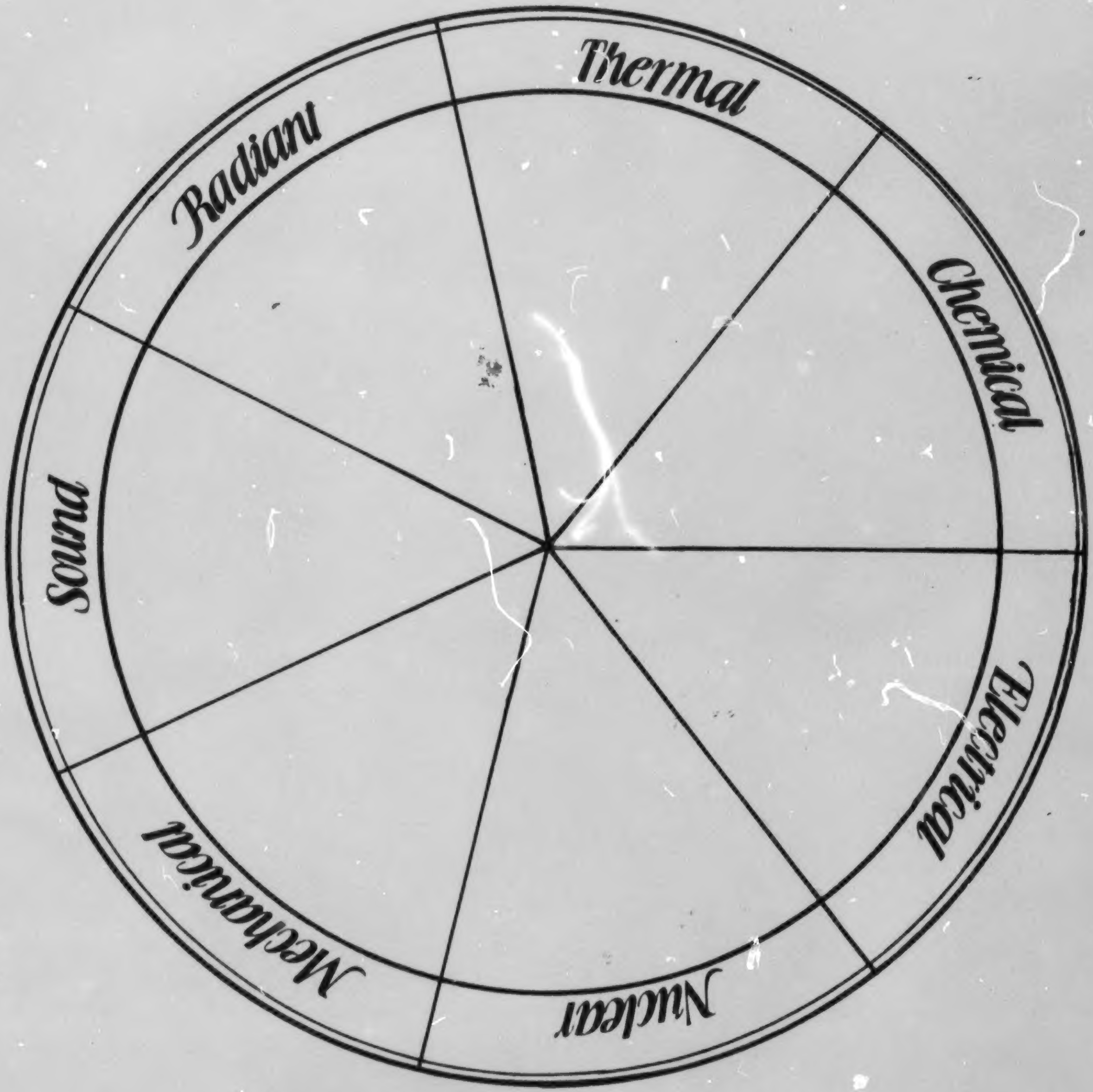
3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Forms of ENERGY in the Home

Find things in your home that you would associate with these forms of energy.


Thermal
Chemical
Electrical
Nuclear
Mechanical
Sound
Radiant

PRESENTS

ENERGY: THE KEY TO MAN'S GREATEST GOALS

10 min.

INSTRUCTIONS:

THESE FILMSTRIPS AND CASSETTES WILL HELP THE STUDENTS:

1. IDENTIFY THE VARIOUS FORMS OF ENERGY.
2. UNDERSTAND HOW THESE FORMS ARE PRESENTLY USED.
3. UNDERSTAND HOW EXPERTS PREDICT THE VARIOUS FORMS THAT WILL SUPPLY OUR ENERGY NEEDS IN THE FUTURE.

NOTES:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

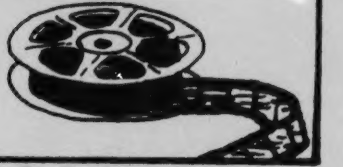
5. How could this activity change the individual's use of energy?

PRESENTS

ENERGY:

A FIRST FILM

No. 1128 14 min.



Instructions:

This film will help the students:

1. Discuss the value of energy and how it changes form.
2. Explain how energy, no matter what form it is in or what transformation it undergoes, orginates from the sun.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

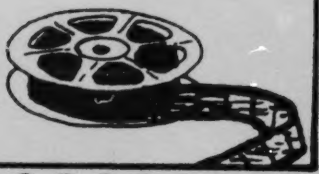
3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

EAC PRESENTS

Energy And Its Forms



No. 1720 17 min.

Instructions:

This film will help the students:

1. Reinforce their knowledge of the seven forms of energy plus an additional form called energy of position or potential energy.
2. Become more aware of the fact that whenever we use energy, we often change it from one form to another.
3. Realize that most energy comes from the sun.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

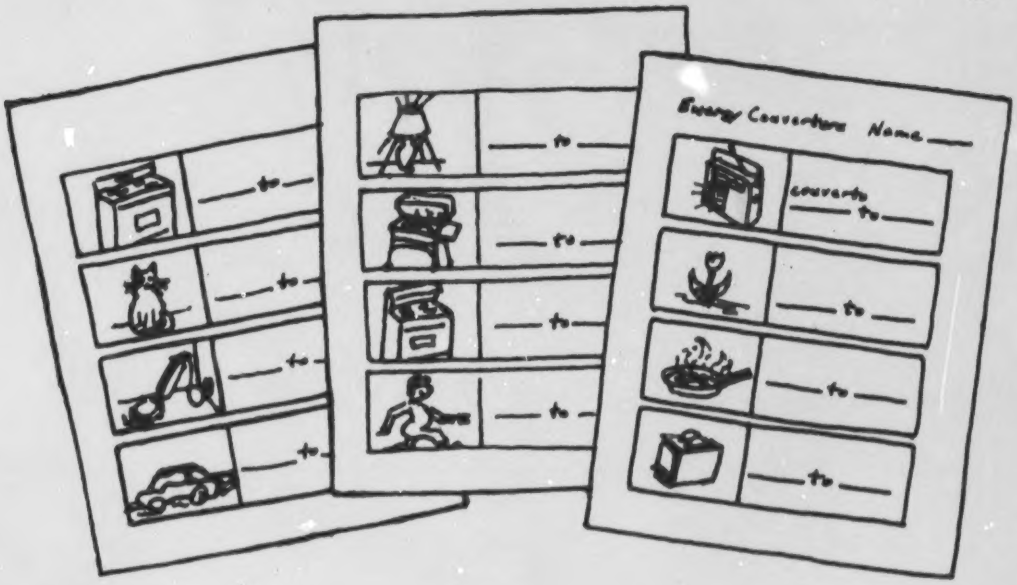
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Energy Converters Drill Sheets


Energy Converters Name
converts
to

Instructions:

Energy conversion means changing one form of energy to another form of energy. Work with the students on this activity by having them fill in the blanks. Each item will convert one form of energy into other forms of energy.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

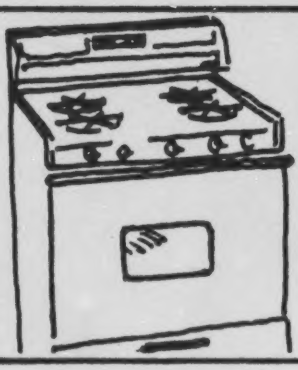
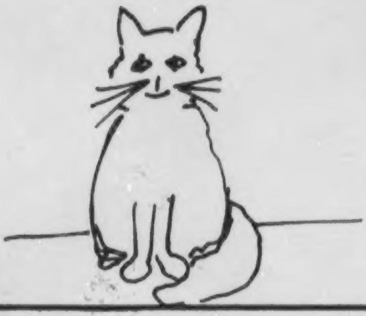
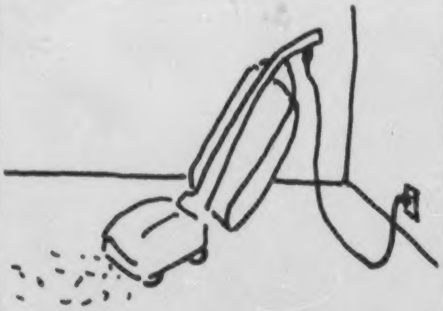
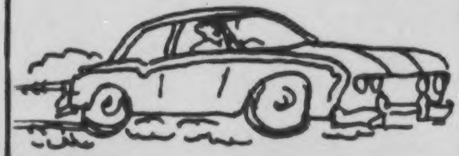
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

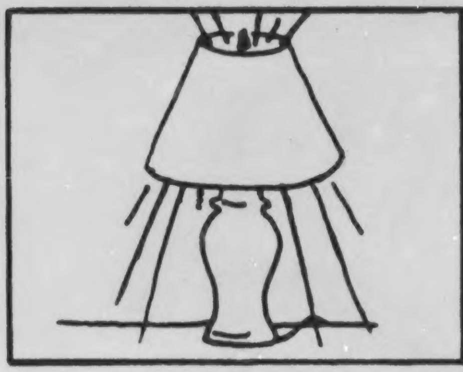
5. How could this activity change the individual's use of energy?

ENERGY *Converters* **Name** ____________________

	**converts** __________ **to** __________
	**converts** __________ **to** __________
	**converts** __________ **to** __________
	**converts** __________ **to** __________

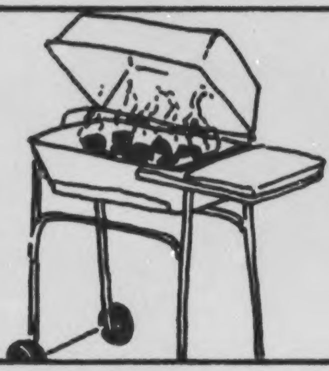
page 1

ENERGY *Converters* **Name** ____________________



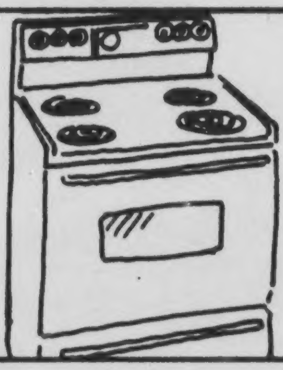
converts

__________ to __________



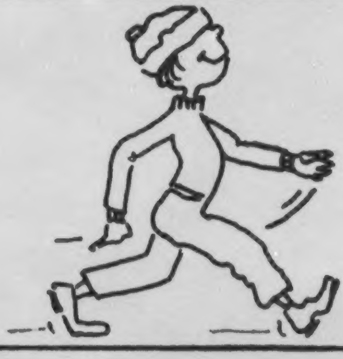
converts

__________ to __________



converts

__________ to __________

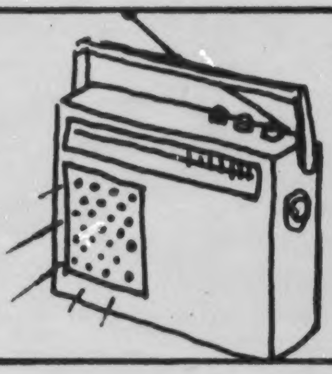


converts

__________ to __________

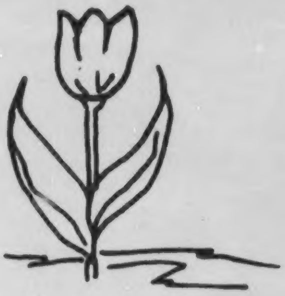
page 2

ENERGY *Converters* **Name** ______________________



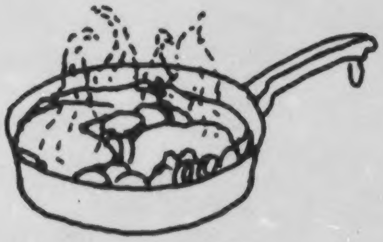
converts

__________ to __________



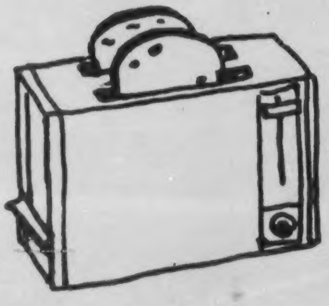
converts

__________ to __________



converts

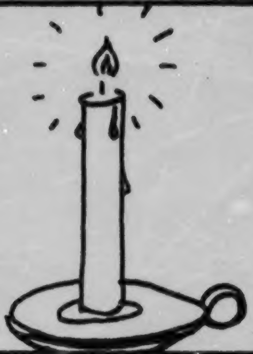
__________ to __________



converts

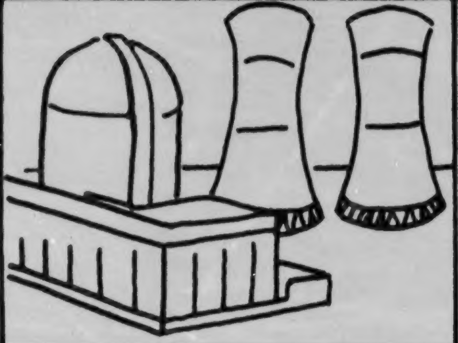
__________ to __________

ENERGY *Converters* **Name** ____________________



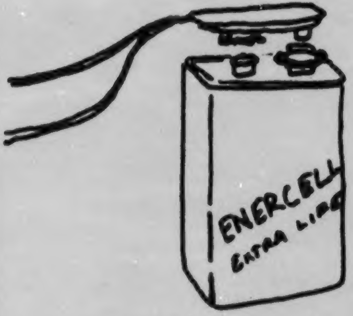
converts

____________ to ____________



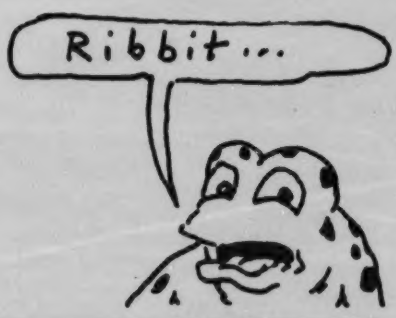
converts

____________ to ____________


ENERCELL
EXTRA LI

converts

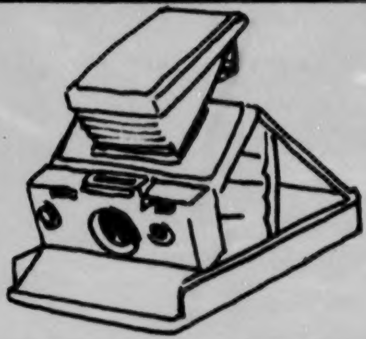
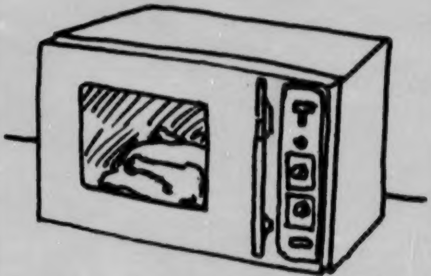
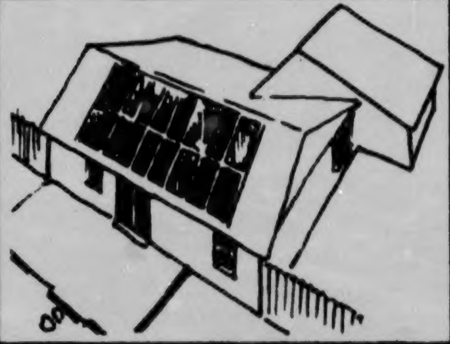
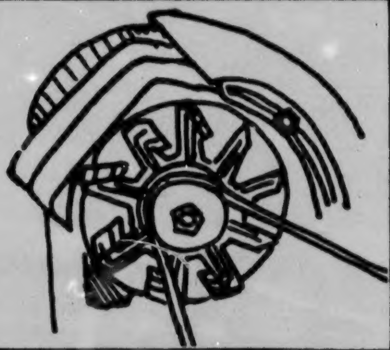
____________ to ____________



converts

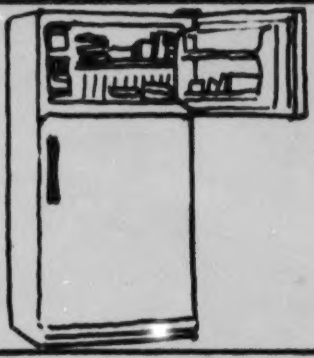
____________ to ____________

ENERGY *Converters* **Name** ____________________

	**converts** ____________ **to** ____________
	**converts** ____________ **to** ____________
	**converts** ____________ **to** ____________
	**converts** ____________ **to** ____________

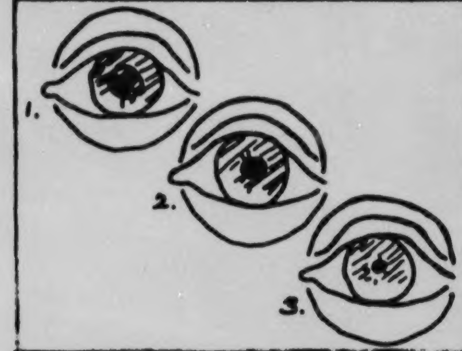
ENERGY *Converters*

Name ____________________



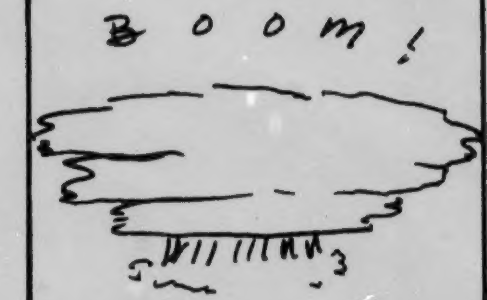
converts

____________ **to** ____________



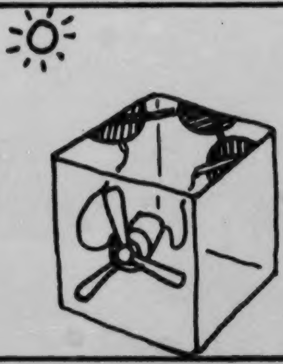
converts

____________ **to** ____________



converts

____________ **to** ____________

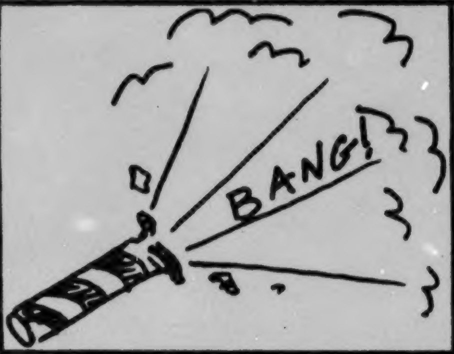


converts

____________ **to** ____________

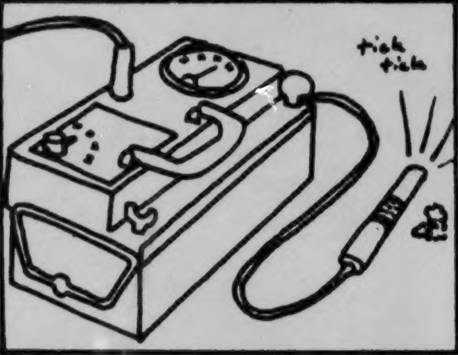
ENERGY *Converters*

Name ____________________



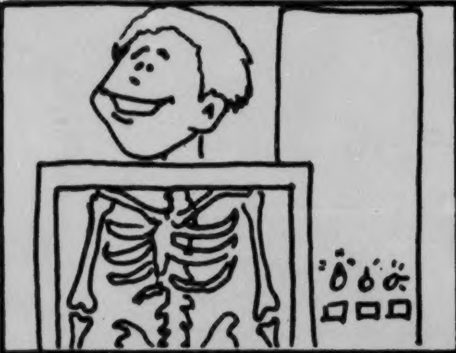
converts

____________ **to** ____________



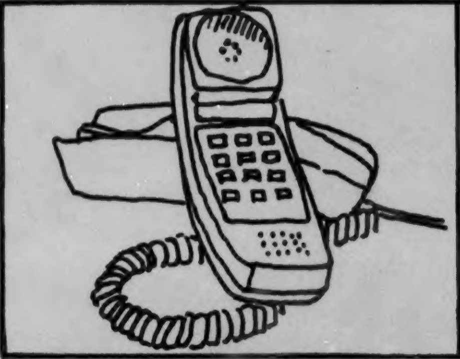
converts

____________ **to** ____________



converts

____________ **to** ____________



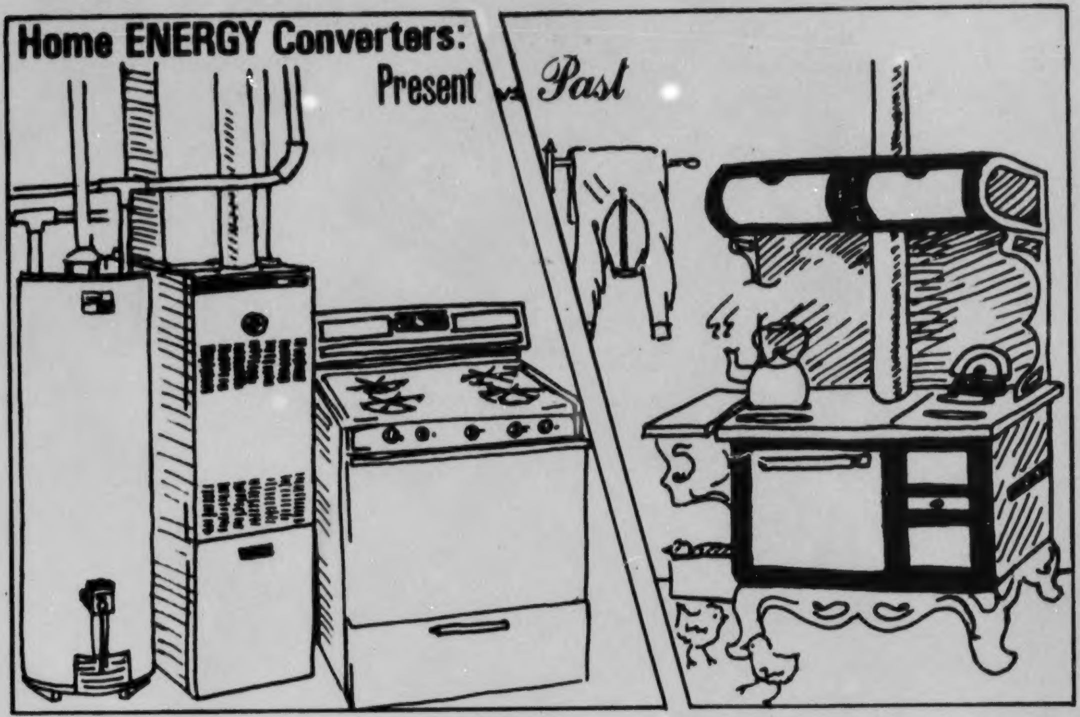
converts

____________ **to** ____________

ENERGY *Converters*

Name ____________________

	converts ____________ **to** ____________
	converts ____________ **to** ____________
	converts ____________ **to** ____________
	converts ____________ **to** ____________



Instructions:

Different conversions are taking place in the home today compared to long ago. See if the students can complete this activity by 1) listing the past names for today's home appliances, and 2) telling what form of energy each item began with (first form) and changed to (second form).

In some cases there was no change in form. The hand washing machine demonstrates mechanical energy (movement of the lever) to mechanical energy (movement of the agitator). The hand washing machine would be a transformer rather than a converter.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Home ENERGY Converters

Can you list the past names of today's appliances and tell the two forms of energy used in home converters of long ago? If there is no conversion taking place, circle the appliance.

Today's Appliance	Past Name		First Form		Second Form
Refrigerator		converted		to	
Air Conditioner		converted		to	
Furnace		converted		to	
Washer		converted		to	
Water Heater		converted		to	
Range		converted		to	
Light		converted		to	
Stereo		converted		to	
Vacuum Cleaner		converted		to	
Food Processer		converted		to	

What was the main form of energy used in the homes of long ago?

What is the main form of energy used in our homes today?

What can we learn by comparing the use of energy and types of conversions in the homes today with long ago?

Home Energy Converters: Present vs Past

Objective: Students will review forms of energy.

Students will apply understanding of converters to old and new kitchen pieces of equipment.

Students will be able to compare the resources of energy used in operating the old and new kitchens.

Students will become aware of how lifestyles have changed over the last one hundred years as far as household chores are concerned.

I. Review of concepts students may have already learned

A. Forms of Energy

1. Review MRCENTS and meaning of each form.

a. Mechanical - movement
b. Radiant - light
c. Chemical - burning, change in molecular structure
d. Electrical - flow of electrons
e. Nuclear - splitting of atoms
f. Thermal - heat
g. Sound - noise

2. Choose several objects from the kitchens that are representative of the energy forms.

a. Butter churn - mechanical
b. Kerosene lamp - chemical, radiant
c. Etc.

B. Converters

1. Review that a converter is an object that changes energy from one form of energy to another.

2. Choose several objects to use as examples or have the students suggest them.

a. Light fixture - electrical to radiant
b. Battery clock - chemical to mechanical
c. Etc.

C. Review resources of energy

1. Stress non renewable energy resources since they are the ones that are used basically in kitchens of today and the past.

a. Coal - a black, solid carbonacious object that burns
b. Oil - a generally thick liquid of varying colors that burns
c. Natural gas - a substance similar to air (gas) that burns

2. Renewable resource - wood was used as an energy resource in the past.

3. The students should realize that a great deal of electricity is used in today's kitchens. It supplies a great deal of energy, but is not a resource of energy. Here in Kansas it

is generated by burning coal, oil or natural gas. It is generated in other ways--hydroelectric, nuclear, geothermal in addition to the conventional way in other parts of the country.

II. Presentation of the old kitchen. As you discuss the objects consider how the work is done in a kitchen today.

A. Washing clothes

1. Scrub board and wash tub

a. Whoever was washing the clothes would fill the wash tub with water probably pumped up from the well. The wash tub filled with water, clothes and homemade soap would be put on a wash stove to be heated.
b. The clothes would be cleaned by being scrubbed on the washboard. What form of energy was used? (Mechanical) Human muscle power was the energy resource.

2. Galvanized washer on wooden legs

a. This invention is more like the washing machines we use at home today. Open the machine to show the students the agitator.
b. The water to wash the clothes still had to be pumped from the well, heated on the laundry stove and dumped into the washer. The same wash water could be used for several loads of washing.
c. Electricity is used to operate our washers. Discuss with the students the conversion of energy forms in the washers of today--electrical to mechanical. Show the students how to operate the old washer by pushing and pulling the handle. Is there a conversion in this activity? (No, it's mechanical to mechanical. Termed a transformer.)
d. The washing time was about forty minutes of pulling and pushing the handle.
e. After the washing was done, the clothes had to be put through the wringer to get the excess water out of them.
f. The rinsing of the clothes was not done in the washing machine, but in tubs arranged near the washing machine. The clothes would go through several rinses. As the rinse water became soapy, it could be used for wash water. This conserved on water usage.
g. Stress with the students that the washer is not a converter, but rather a transformer.

B. Drying clothes

1. Ask the students if they see a clothes dryer. (They generally talk about the wire line above the table.)

2. Ask how their clothes are dried. They'll talk about a clothes dryer. Discuss it as a converter--electrical to thermal and mechanical.

3. Clothes were generally dried outside. Two renewable resources of energy were used to do the drying--wind and solar.

C. Cleaning carpets and floors

1. Find the rug beater on top of the kerosene stove. Ask the students for what they thought the object was used. Ask what form of energy it represents. (Mechanical) What energy resource? (Muscle power)
2. Carpet sweeper (located next to the washing machine) - Demonstrate how it was used discussing the form of energy it represents (Mechanical) and the energy source (Muscle power).
3. Ask the students what they use at home to do the same work. They should answer a vacuum cleaner--a converter, electrical to mechanical.
4. Floor buffer - It was used to polish hard wood floors. Note the weight of it. Ask the students to visualize their school custodian using one of these. Do you think he'd buff the floors as often as he does now? Why or why not? What does he use? (Electric buffer) Is it a converter? (Yes, electrical to mechanical) Why is it easier to operate? (It is powered by electricity and doesn't require as much of his energy.)

D. Lighting

1. Although electricity was in minor use one hundred years ago, most people used gas or kerosene lamps for lighting.
2. Kerosene is made from coal oil. It is burned which indicates that it is what form of energy? (Chemical)
3. Is the kerosene lamp a converter? (Yes, chemical to radiant)
4. Notice the glass chimney on the lamp. As the kerosene burned, a residue would collect on the chimney and it would have to be cleaned periodically so that the persons using the lamp could get full advantage of the light from it. Electricity is a clean energy source, kerosene wasn't.

E. Kerosene stove for cooking

1. The kerosene was put into the glass bottle, turned upside down and allowed to run through the pipes to the burners.
2. Was the kerosene stove a converter? (Chemical to thermal)

F. Woodburning stove

1. Would the wood stove be a converter? (Chemical to thermal)
2. The wood was cut up into chips and put into a metal basket type structure under the left most removable circles on the cooking surface of the stove.
3. The entire stove was made out of cast iron. As the stove heated up the heat would rise allowing for food to be warmed

in a warming oven above the cooking surface.

4. In addition to being used as a cook stove, the woodburning stove was used as a furnace in the cold weather seasons. Do you think homes were kept as warm as we can keep our homes today? Why or why not?

5. The woodburning stove also was used as a hot water heater. (A reservoir of hot water was located at the back or the side of the stove.) The reservoir was probably about the size of the copper wash tub you saw earlier. What would the hot water be used for? (Bathes, dishes. Water to wash clothes was heated up separately on a wash stove.)

   a. Consider the amount of hot water that would be contained in the reservoir. Suppose that that was all of the hot water the entire family had for its bath water. How would your family make sure that they all got baths on the same day from that amount of hot water? (Take baths in the same water, use very small amount of water.)
   b. Consider how our lifestyles would be different from what they are now if we didn't have our hot water heaters to supply our demands for hot water.

6. Review how important a piece of equipment the woodburning stove was--cook stove, furnace and hot water heater. One piece of equipment took care of what we now have to have three pieces of equipment to accomplish. This is an example of how our use of energy resources has increased.

G. Refrigeration - the icebox

1. Is the icebox a converter? (No, since there is no part of the object that changes energy from one form of energy to another. Our refrigerators are converters - electrical to mechanical.)

2. A block of ice brought to the home by the iceman was put into the part of the icebox that held it. A drip pan was put in an area below the metal ice holder. The food was put into a storage place next to the ice container.

3. Not much food was kept in the icebox. Small amounts of food that were left over from a meal or were to be served at the next meal were kept there.

   a. Meats were preserved and kept in smoke houses, or they were cured with salt or dried. Very little fresh meat was used by comparison to what we use today.
   b. Fruits and vegetables were kept in cool places--cold cellars, root cellars, trenches dug in fields. Canning was a much used way of preserving foods.

H. Pumping water

1. Many homes one hundred years ago did not have the water pump in the house.

2. What form of energy is represented by the pumping action to bring the water up from the bucket under the sink and allow it to pass through the pump? (Mechanical)

3. How do we get water into our homes? Do we still use mechanical energy to pump it into our houses? (Not really. A person mechanically turns the faucet handle, but that isn't what pulls the water into the house. The pressure is created by electrical pumps at pumping stations.)
4. Is the pump a converter or a transformer? (Neither. There was no change or transfer of energy forms.)

I. Sewing machine

1. Is the sewing machine a converter? (No, it is a transformer - mechanical to mechanical.)
2. To make it operate you must pump the treadle at the base of the machine. Position one foot on the back of the treadle and one on the front and use a pumping action to operate the machine.

J. Small pieces of equipment

1. Butter churn
    a. Is it a converter? (No)
    b. Demonstrate how it works by turning the crank which in turn turns the paddle.
    c. Ask the students what kind of energy was used to churn butter. (Mechanical) In what ways are different forms of energy used to make butter today? (The milk has to be transported to the dairy using chemical energy for gasoline; electricity is used to process the butter and to store it in a cool place; the butter has to be transported to the store and to homes using more chemical energy in the form of fuel.)
2. Clothes iron
    a. Is it a converter? (No)
    b. Where does it get its heat? (From the stove)
    c. Is the iron you use at home a converter? (Yes, electrical to thermal)
    d. Why would a person doing the ironing years ago have several irons on the stove at one time? (As the iron lost its heat while it was being used, it couldn't continue to press clothes. If the job was to be kept going several irons had to be ready for use.)
    e. Electricity allows us to have a constant use of one piece of equipment rather than needing several.
3. Curling iron
    a. Is it a converter? (No)
    b. It would be heated on the stove or in the chimney of the kerosene lamp.
    c. The curling irons we use today are converters - electrical to thermal.
    d. What else do we use today besides a curling iron to curl hair? (electric curlers, etc.)

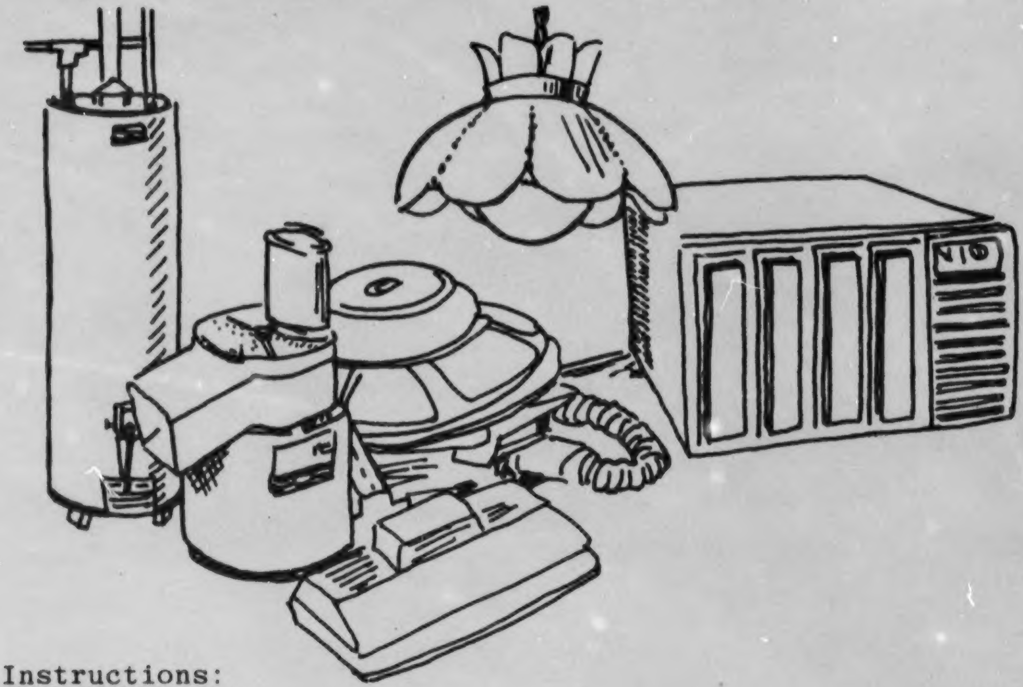
4. Coffee pot
    a. Is it a converter? (No)
    b. How have coffee pots changed from then until now? (Many of the ones we use today are converters - electrical to thermal.)
5. Egg beater
    a. Is it a converter? (No)
    b. What might be used to do the same work today? (Electric mixer, blender) Are they converters? (Yes, electrical to mechanical)
6. Juicer
    a. Is it a converter? (No)
    b. What might be used to do the same work today? (A hand juicer or an electric juicer) Is it a converter? (The electric juicer is - electrical to mechanical)

K. Have the students walk around the kitchen and handle the pieces of equipment with care, of course.

L. After they have experienced working in the old kitchen ask the students to consider which kitchen required the most energy to be worked. The old kitchen required a great deal of muscle energy, however, the new kitchen with all of its labor (muscle) saving devices perhaps uses more energy in the long run. We are not aware of it because it is not our own energy.

We hope that the students leave the Old/New Kitchen experience with a better understanding of how we use energy in our kitchens today as compared to how it was used in kitchens a century ago.

Today's ENERGY Converters in the Home



Instructions:

Energy conversion means changing one form of energy to another. See if the students can complete this activity by telling what form of energy each item begins with (first form) and changes to (second form). Then have the students try to think of other examples.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

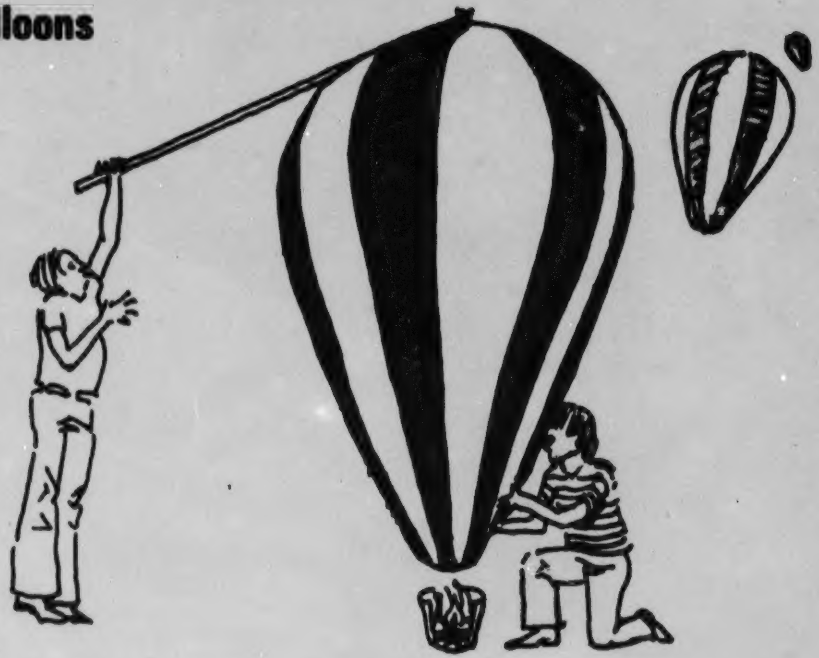
5. How could this activity change the individual's use of energy?

Today's ENERGY Converters in the Home

Can you tell what forms of energy are converted in each item below?

Converters		First Form		Second Form
Refrigerator	converts		to	
Air Conditioner	converts		to	
Furnace	converts		to	
Washer	converts		to	
Water Heater	converts		to	
Range	converts		to	
Light	converts		to	
Stereo	converts		to	
Vacuum Cleaner	converts		to	
Food Processer	converts		to	
Add others:				
	converts		to	
	converts		to	
	converts		to	
	converts		to	
	converts		to	

Hot Air Balloons



Instructions:

Energy is used to make heat. Many machines use this heat to run. In this activity, paper burns and converts chemical energy to thermal energy. The heated air expands and the balloon goes up. This converts thermal energy to mechanical energy.

Further questions for consideration:
1. How does a car engine get heat and how does it run?
2. How does the wind get heat and what makes it blow?

The instructions for making the hot air balloon are in the package. Balloons may be flown at your school or at the Energy Adventure Center. If you choose to fly your balloons at the Center, please make arrangements with your facilitator. (945-8335).

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

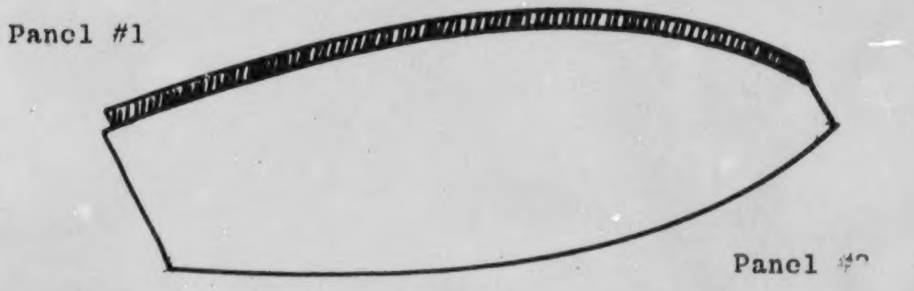
4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

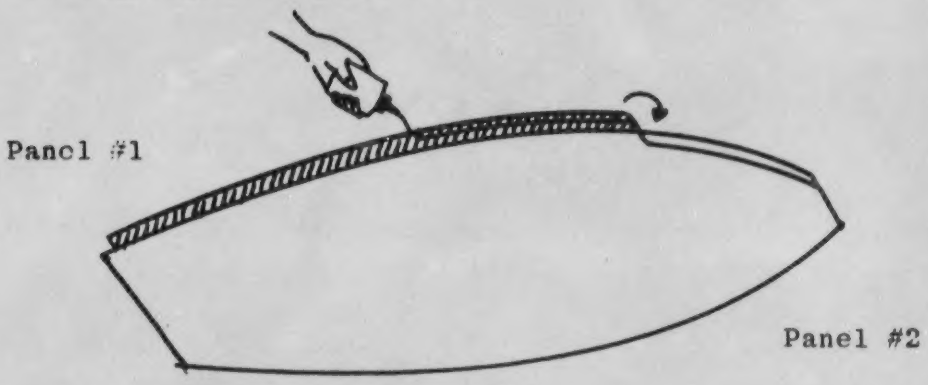
Hot Air Balloons

The Hot Air Balloon kit contains seven panels of tissue, wire for the bottom ring, and cord for tying off the top of the balloon. Almost any paste or glue may be used although white liquid glue such as "Elmer's Glue" is an excellent choice. Glue stick is very easy to use but must be applied heavily and pressed firmly together at once as you go along. Please read the instructions completely before beginning construction.

1. Select two different color panels. Lay the second panel on top of the first. Allow approximately 1/2 inch of panel #1 to show along the entire edge. This forms a margin which will be used for gluing.



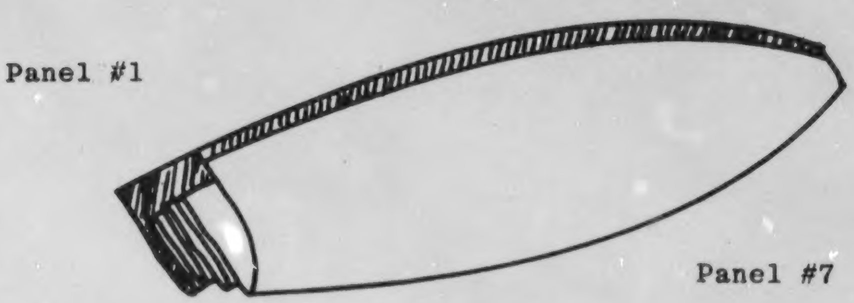
2. Apply a thin line of glue to panel #1 along the 1/2 inch margin. Fold this 1/2 inch margin of panel #1 up and over the edge of panel #2. Use glue sparingly. If too much is used, the excess will tend to seep through and stick subsequent panels together.



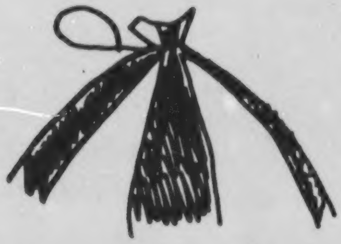
3. Alternating colors, select a third panel. Place panel #3 on top of panel #2. This time allow a 1/2 inch margin of panel #2 to show. This margin must be the unglued side of panel #2. Repeat gluing as in step 2.

4. Glue the remaining four panels in the same manner being certain to use the unglued edge as a margin each time. During this process, carefully separate all folds to keep them from sticking together.

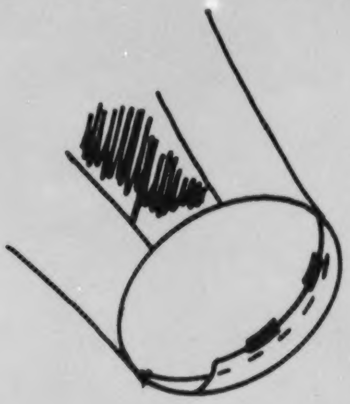
5. Carefully lift the unglued edge of panel #7 away from the stack, and lay it on top of panel #1 as shown in the diagram. Allow a 1/2 inch margin of panel #1 to show along the edge of panel #7. Glue as before.



6. Using the cord provided, tie the top of the balloon about one or two inches back from the end. This will close the hole in the top and, if a loop is left in the string, provide a method for hanging.



7. Open the bottom of the balloon and form the wire into an appropriate sized ring. You may wish to cut off excess in order to reduce weight. Place the ring inside the opening and fold the tissue up and over it forming a one to two inch "hem." Tape using cellophane tape.



8. Inflate the balloon by either holding by the ring and moving it to catch the air or by placing it over a low speed fan of some sort. Check for holes. Make necessary repairs with cellophane tape.

9. Hang the balloon and allow it to dry for two hours. The balloon is now ready for launching.

Ideal launching conditions usually occur in the morning or evening when there is little wind. A good indicator is the flag on the flagpole. If the flag is hanging nearly motionless, conditions are ideal.

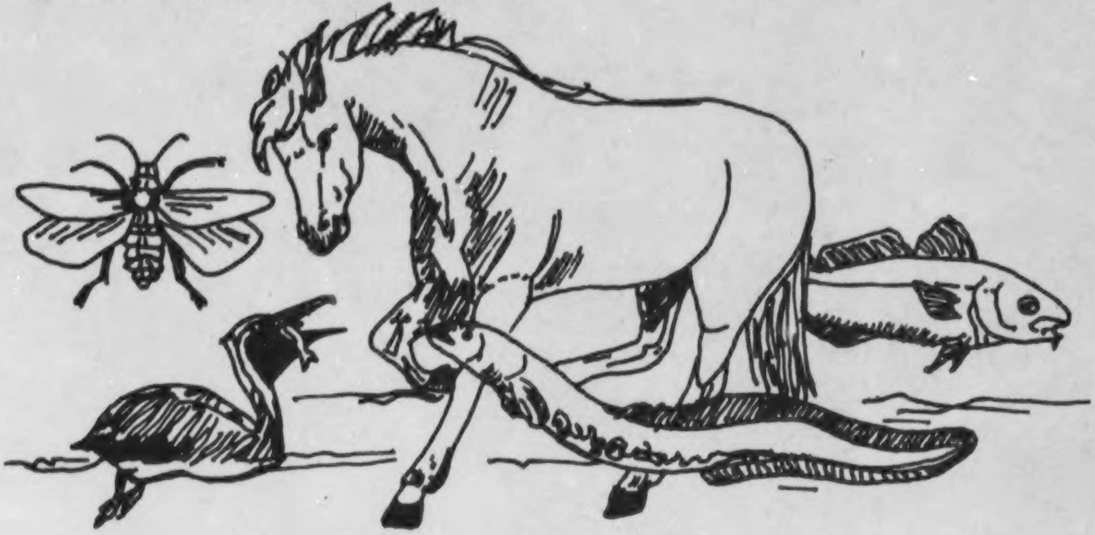
There are several methods of filling the balloon with hot air. One of the simplest involves using either a five gallon bucket or a waste basket and newspapers. To inflate the balloon, crumple three single sheets of newspaper and place them in the bottom of the bucket. Set these on fire. Hold the balloon opening over the bucket by having two persons steady the sides and top. Caution! The balloon is flammable. Care should be taken to maintain the balloon high enough above the bucket to avoid the flames.

An alternative method involves placing a metal lid with a five inch hole and a two foot section of six inch stove pipe on top of the bucket. The remainder of the procedure remains the same. The materials are a little harder to obtain, but the possibility of fire is substantially reduced.

The inflation and launching of the balloon should be done only by adults.

After the balloon is sufficiently full (a slight upward pull will be felt) it can be released. Height of ascension depends on the heat of the air inside the balloon at the time of release. The balloon will stay aloft until the hot air inside has cooled. The balloon can be used over and over again. Slight damage can be repaired with cellophane tape.

Animals Are Converters



Instructions:

Energy conversion means changing one form of energy to another form of energy. Animals convert chemical energy (food) into other forms of energy. See if the students can complete this activity. (See attached student form.)

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

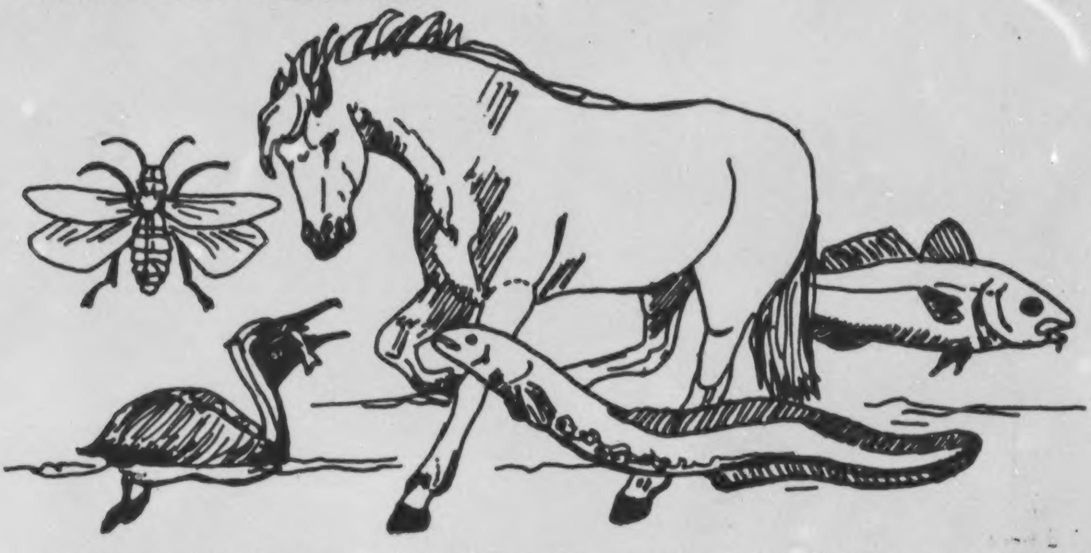
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

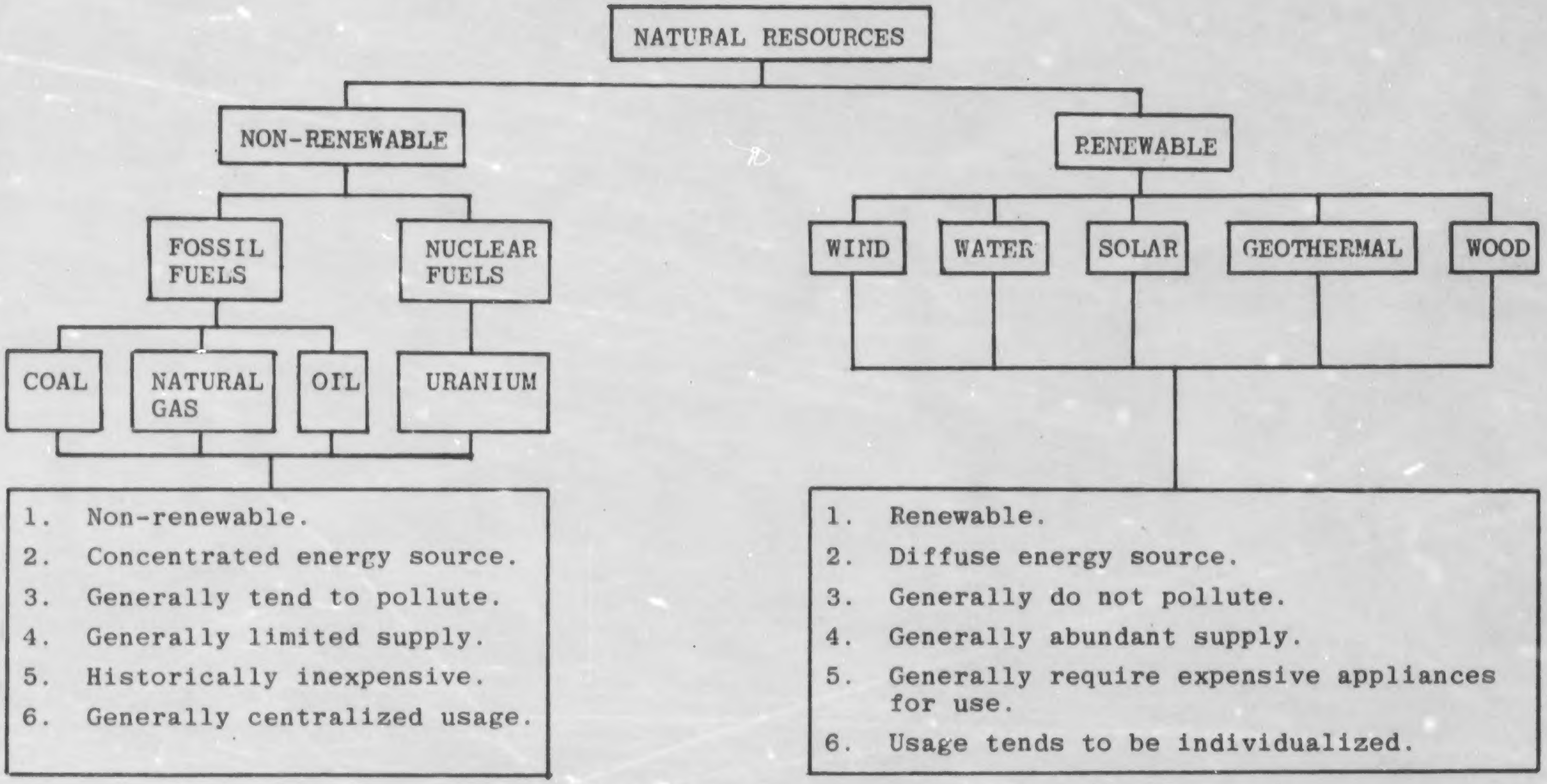
Animals Are Converters



These animals convert chemical energy (food) to which of these other forms of energy?

NAME OF ANIMAL	ELECTRICAL	MECHANICAL	RADIANT	SOUND	THERMAL
BIRD					
EEL					
FIREFLY					
FISH					
HORSE					
MAN					
OTHER					

Resources and Energy


NATURAL RESOURCES
NON-RENEWABLE
RENEWABLE
FOSSIL FUELS
NUCLEAR FUELS
COAL
NATURAL GAS
OIL
URANIUM
WIND
WATER
SOLAR
GEOTHERMAL
WOOD

1. Non-renewable.
2. Concentrated energy source.
3. Generally tend to pollute.
4. Generally limited supply.
5. Historically inexpensive.
6. Generally centralized usage.

1. Renewable.
2. Diffuse energy source.
3. Generally do not pollute.
4. Generally abundant supply.
5. Generally require expensive appliances for use.
6. Usage tends to be individualized.

Map Study of Fossil Fuels

Geological Symbols

●	☼	✹	▬
OIL	GAS	OIL and GAS	COAL

Instructions:

Students may use reference books supplied by the teacher to research locations of fossil fuels in the United States. Blank maps are available at the Energy Adventure Center so that the children may record their findings and identify types of fuels by specific names. Try to think of other ways to use this information to enrich the activity.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

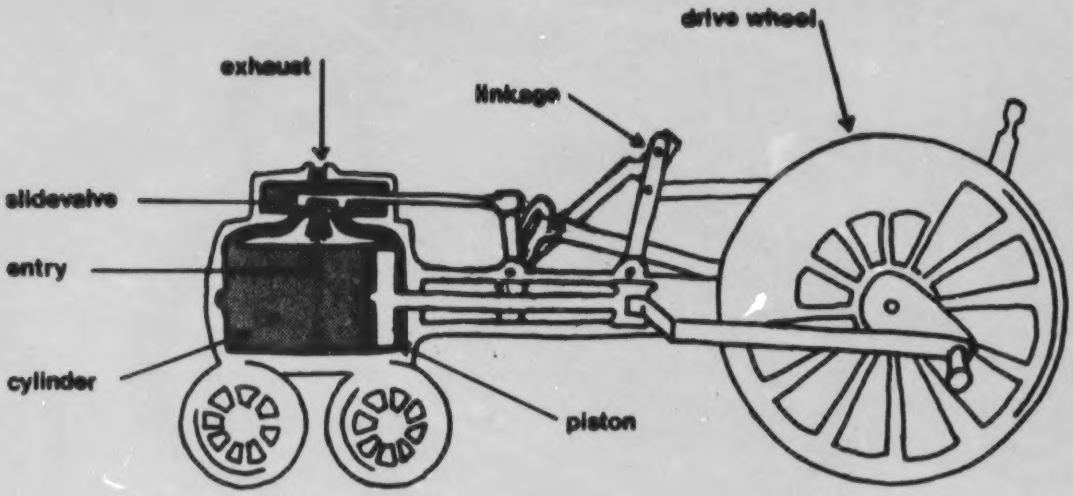
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Steam Engine Demonstrator



Instructions:

This steam engine demonstrator shows how steam is harnessed to provide mechanical energy. Rotating the large drive wheel counter-clockwise causes the piston, valve, and linkages to move, showing the flow of steam in the engine. Steam enters through the hole in the slide valve above the cylinder and is shunted to one port or another by the slide valve. After the steam enters one of the ports it expands and pushes the cylinder forward. At the same time the old steam on the other side of the cylinder is forced out the other port, past the slide valve and out the exhaust at the top. At the end of the stroke, the linkages move the slide valve which reverses the flow of steam and drives the piston back into the cylinder to complete the cycle.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

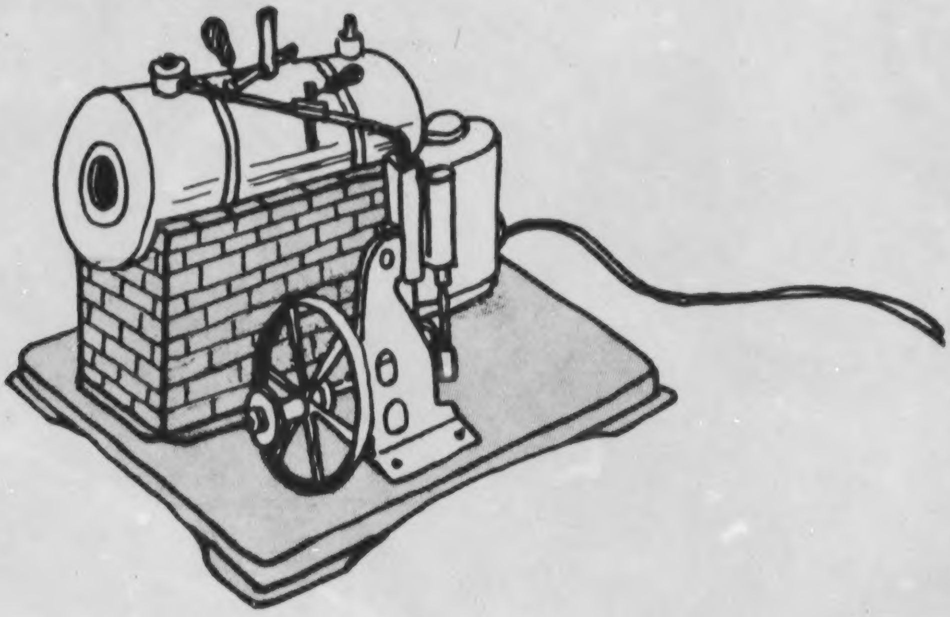
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Steam Engine



Instructions:

This steam engine operates when water boils into steam which expands and pushes a piston up and down in a cylinder. Heat for boiling water can be supplied by burning coal, oil, or wood, as in large steam engines, or by a small electrical heating element under the boiler, as in this small steam engine.

Unscrew the safety valve. Using a funnel, pour tap water into the boiler until the viewing window shows half full. Never allow water to drop below viewing window level. Replace the safety valve and washer. Check the safety valve spring by pulling up on the stem. Close the throttle valve (turn at a right angle to pipe) and open whistle (straight up). Plug in the electrical heating unit and wait until the whistle blows forcefully. Close the whistle valve, open the throttle, and rotate the wheel to start.

Steam Engine

Caution: Boiler, safety valve, steam pipe, and cylinder will be very hot and can cause burns. Run only while water level is visible through viewing window. Release all pressure by opening the whistle and the throttle valve, then open safety valve for refilling. Do not immerse in water.

There are some steam powered shops and/or a miniature power plant that may be hooked up to the steam engine to let the students see what the engine can run.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

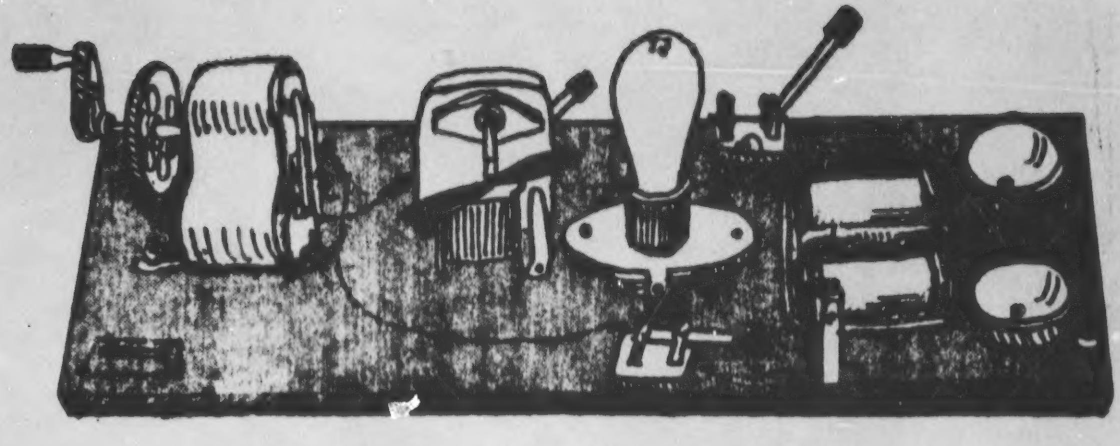
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

ENERGY Conversion Center



Instructions:

The energy conversion center demonstrates conversion of energy from mechanical to electrical energy and then back into mechanical, radiant, sound, thermal, and chemical energy. The center also demonstrates the law of conservation of energy which means that any energy used in one area must be supplied from another area.

The energy conversion center consists of a generator, motor, lamp, bell, and rectifier. By turning the crank on the generator, mechanical energy can be converted to electrical energy. However, if the switches are open and no circuit is complete, then no work is being done in the circuit and little energy is used. Closing the different switches of the center allows the electricity to be converted into different forms. When this occurs, more energy is used and the generator crank becomes harder to turn. All the energy conversions are obvious except thermal, which is a by-product of radiant conversion in the light, and chemical, which is demonstrated by electrolysis (electrical generation of hydrogen and oxygen gas by wires in a glass of water). The electrolysis equipment is attached at the terminals labeled "rectifier".

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

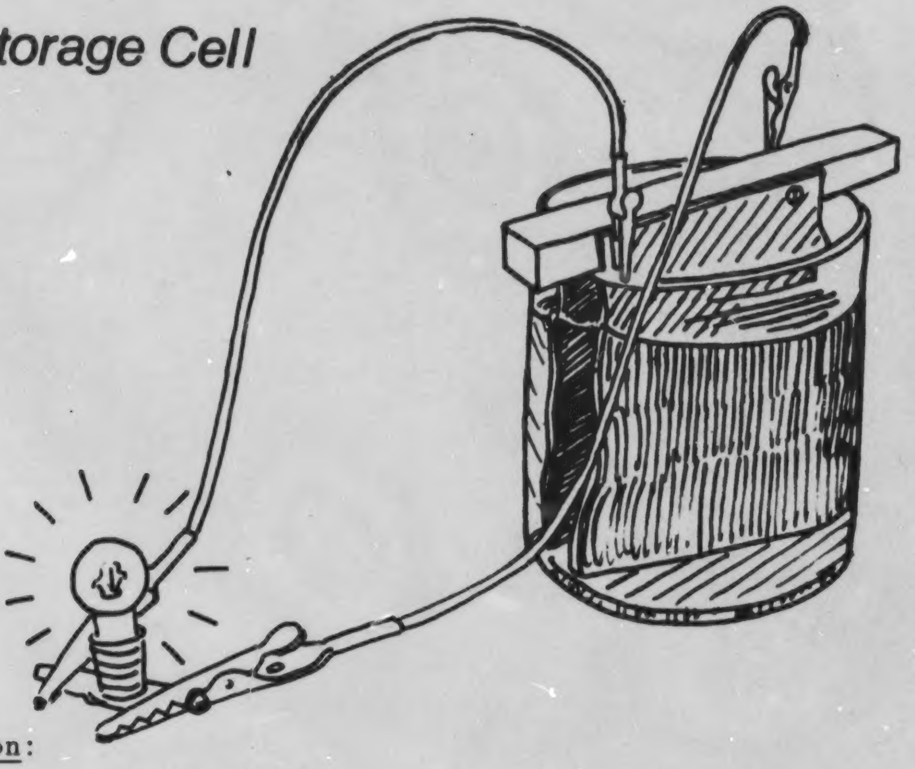
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Lead Storage Cell



Instruction:

Fill the lead storage cell with a solution of magnesium sulfate. Attach the terminals of the cell to the output terminals of the Energy Conversion Center. With all switches open, allow the students to turn the generator until they believe that the cell is charged. Detach the Energy Conversion Center and connect a small light bulb or other device to the test leads. Allow the students to try several times. Discuss other possible options to produce a useful battery.

Attach the battery charger to the lead storage cell. Note the pronounced bubbling. There will also be a slight color change in the lead. This illustrates a conversion of electrical energy to chemical energy. Leave the charger attached for approximately two minutes. Repeat the light bulb test. Discuss the differences between the use of the charger vs. the Energy Conversion Center in activating the cell. What are the trade-offs?

Which of the following questions could be answered with this activity?

1. What is energy doing?

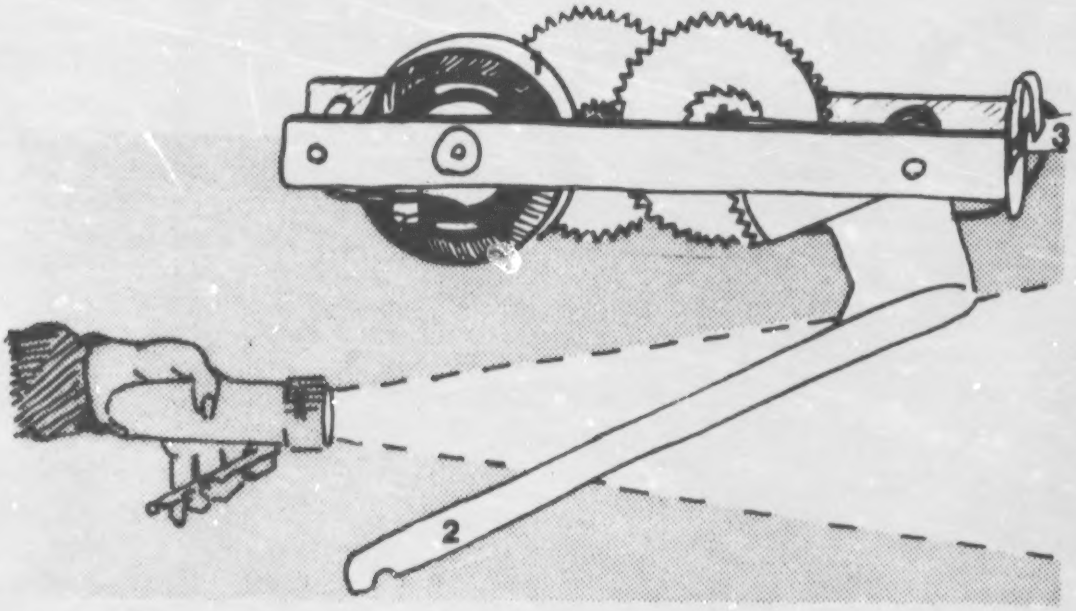
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Flywheel Flashlight



Instructions:

The flywheel flashlight has a small generator(1) inside the red case that spins when the handle(2) is moved. This small generator has a magnet and wire assembly which produces electricity much the same as feet rubbing on a carpet. The light(3) will shine only as long as the generator is spun by the handle. This takes more human energy but less chemical energy (batteries). Conversions are chemical to mechanical in the hand, mechanical to electrical in the generator, and electrical to (thermal) radiant in the light bulb.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

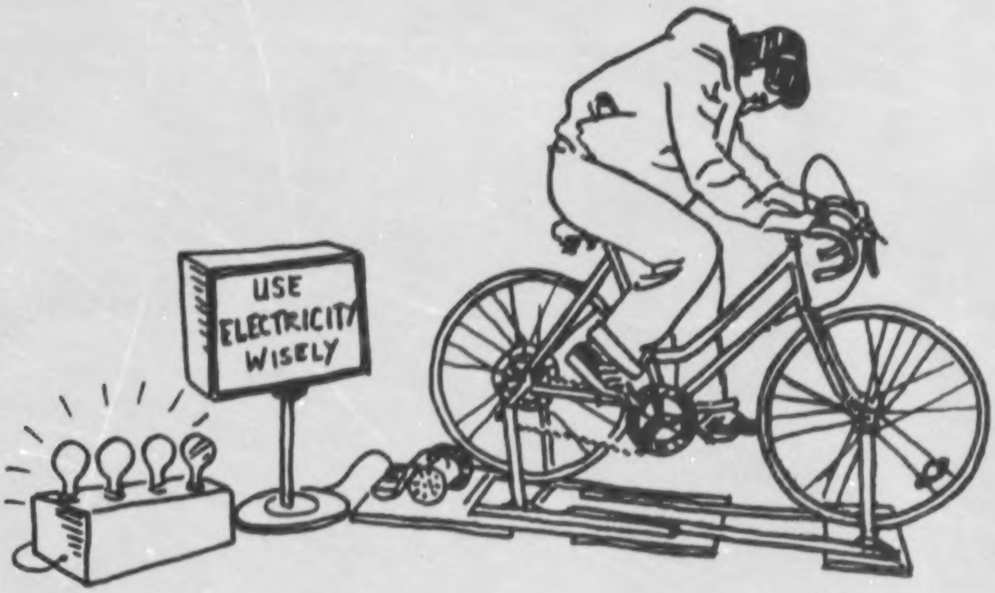
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Bicycle Generator



Instructions:

This generator is large enough that a bicycle is used to spin it. Four lights are plugged into the recepticle by the generator. The lights are wired so that when 100 watts of electricity are generated one light bulb will light, when 200 watts of electricity are generated two light bulbs light, and so on until 400 watts and four bulbs light. The "Use Electricity Wisely" sign has an additional 180 watts of three 60 watt bulbs. Students may be asked to compare the wattage they generate with that of household items they use at home. Conversions used here are chemical to mechanical in the legs, mechanical to electrical in the generator, and electrical to (thermal) radiant in the lights.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

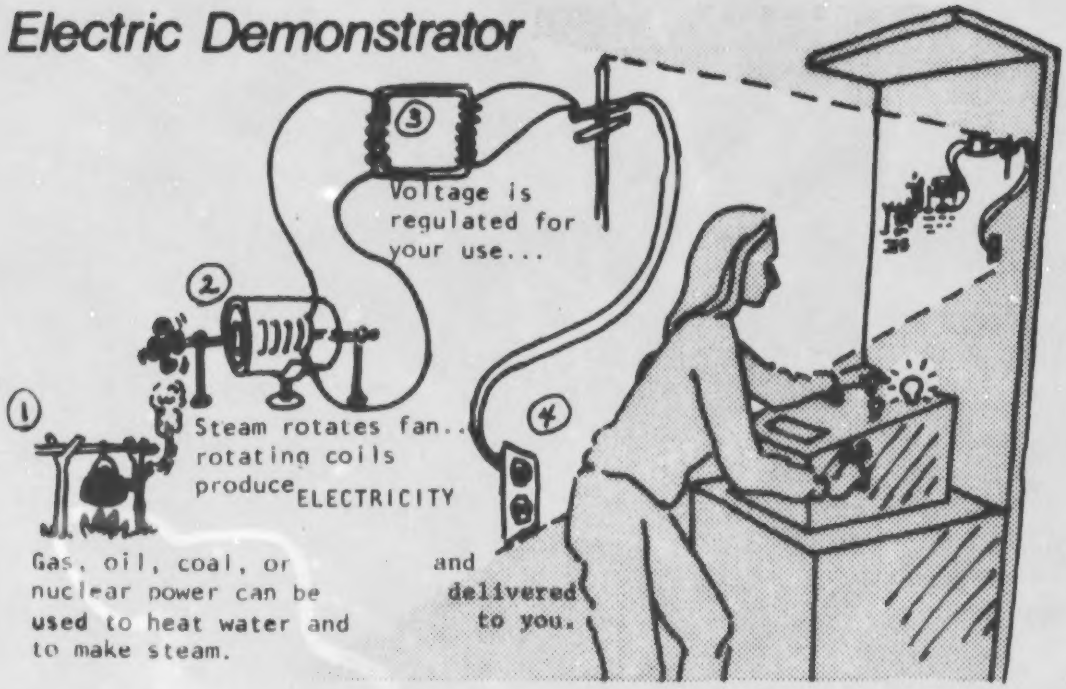
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Electric Demonstrator


③
Voltage is regulated for your use...
②
①
Steam rotates fan.. rotating coils produce ELECTRICITY
④
Gas, oil, coal, or nuclear power can be used to heat water and to make steam.
and delivered to you.

Instructions:

This panel has a pictorial story of how electricity is produced by KG&E. Chemical energy (coal, natural gas, oil) or nuclear energy is used to heat water (thermal) which expands into steam (mechanical) which pushes a turbine attached to a generator (electrical). The electricity is led through wires to the home where it is shown to be converted to light (thermal, radiant). After tracing the energy conversions and efficiencies, students may crank a generator attached to several light bulbs.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

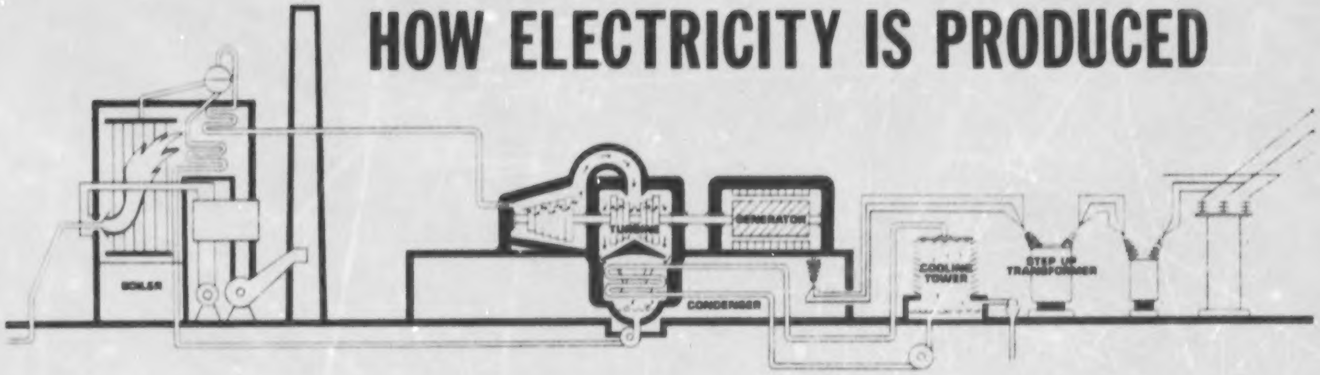
2. What forms are being converted?

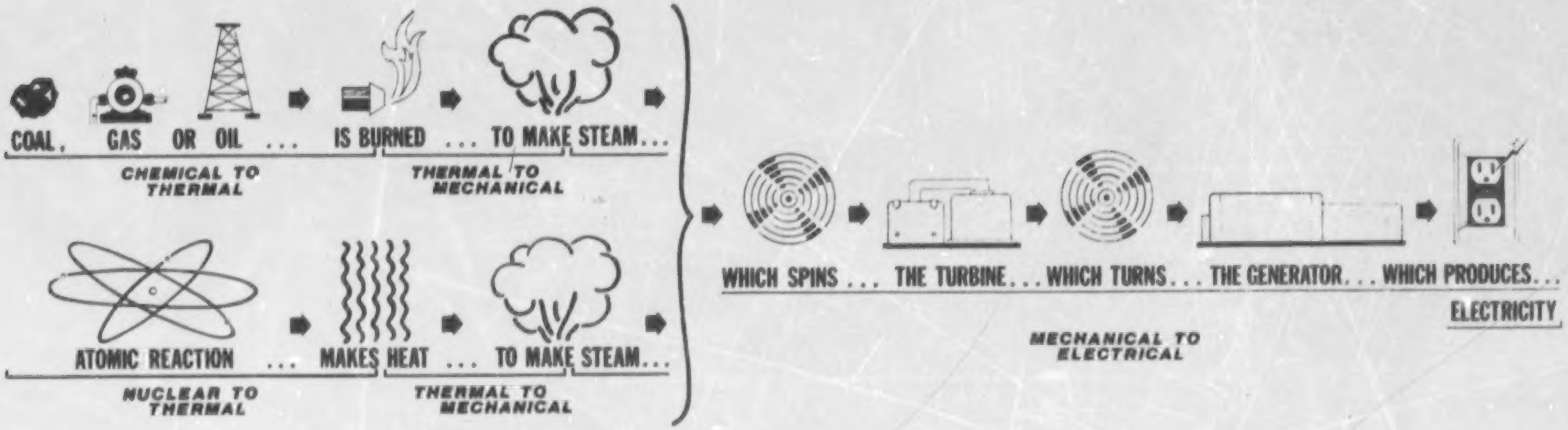
3. What resources are being used?

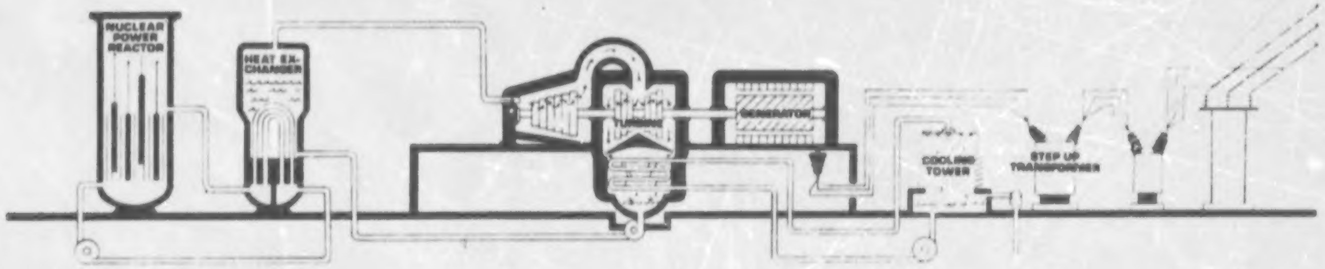
4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

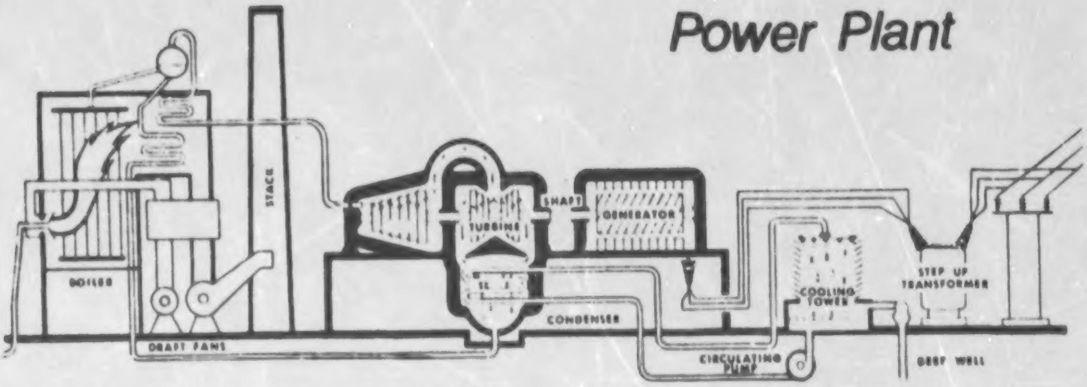
HOW ELECTRICITY IS PRODUCED

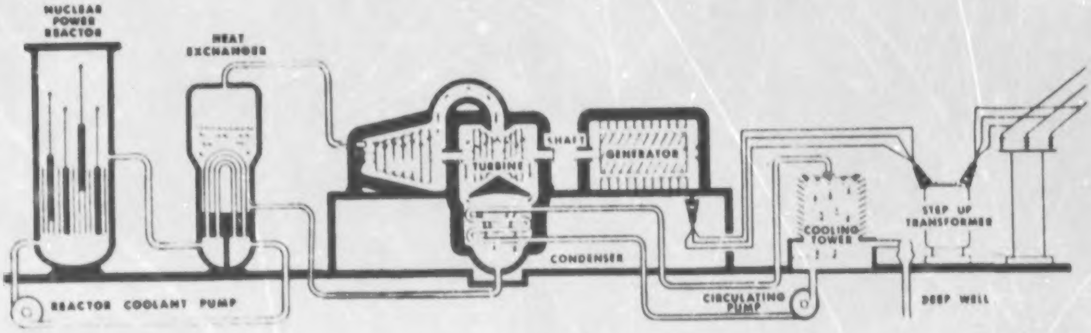

BOILER
TURBINE
GENERATOR
CONDENSER
COOLING TOWER
STEP UP TRANSFORMER


COAL, GAS OR OIL ...
IS BURNED ...
TO MAKE STEAM...
CHEMICAL TO THERMAL
THERMAL TO MECHANICAL
ATOMIC REACTION ...
MAKES HEAT ...
TO MAKE STEAM...
NUCLEAR TO THERMAL
THERMAL TO MECHANICAL
WHICH SPINS ...
THE TURBINE...
WHICH TURNS...
THE GENERATOR...
WHICH PRODUCES...
ELECTRICITY
MECHANICAL TO ELECTRICAL


NUCLEAR POWER REACTOR
HEAT EX-CHANGER
TURBINE
GENERATOR
COOLING TOWER
STEP UP TRANSFORMER

Power Plant


STACK
BOILER
DRAFT FANS
TURBINE
SHAFT
GENERATOR
CONDENSER
CIRCULATING PUMP
COOLING TOWER
STEP UP TRANSFORMER
DEEP WELL


NUCLEAR POWER REACTOR
HEAT EXCHANGER
REACTOR COOLANT PUMP
TURBINE
SHAFT
GENERATOR
CONDENSER
CIRCULATING PUMP
COOLING TOWER
STEP UP TRANSFORMER
DEEP WELL

Instructions:

A field trip to the power plant should have a minimum of two effects: 1) acquaint the student with the process of generating electricity, and 2) show the student the general systems necessary to generate electrical power. These systems which should be explained in advance are the boiler, turbine, generator, condenser, and control room. The forms of energy are chemical converted to thermal converted to mechanical converted to electrical.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Murray Gill Slides

1) Overview shows tanks, burner decks, boiler, steam drum, turbines, generators, switch yard, etc. These all help to convert chemical to thermal to mechanical to electrical.

2) The first form of energy is chemical energy, which is either natural gas or fuel oil. The natural gas comes through these houses which meter the amount used.

3) Fuel oil comes by tank truck or by rail and is stored in these tanks. The tanks hold 500,000 barrels and would last for 3 to 5 weeks during a natural gas cut-off.

4) Fuel oil is like thin tar. It is very heavy, sticky, and black.

5) This view shows the 3 burner decks (2nd, 3rd, and 4th floors). Behind the burner decks are the large box-like boilers.

6) Air is blown from large fans called "forced draft fans"...

7) through ducts into the bottom of the boiler.

8) The natural gas or fuel oil is shot into the side of the boiler by this row of pipes. They are color-coded brown All brown pipes carry natural gas.

9) The small round window in the center shows the glow of the fire inside. It is very noisy here because of the combustion of the fuel.

10) Inside, the boiler walls are lined with vertical pipes. These pipes carry water. Here the thermal energy boils the water and converts to mechanical energy. The pipe on the left is a cross-section of this boiler pipe. Notice the nicks on the inside. This was caused by the abrasive action of water droplets in the steam. The pipe on the right carried cooling water. It has nearly closed because of the deposits of mud and minerals left behind by this water.

11) The water used in the boiler must be kept very clean to prevent deposits or the corrosion of the pipe. Tests in chemistry lab monitor how clean the water is.

12) Even though boiler water is much cleaner than the water you drink, pipes still rust and corrode. Here are some damaged sections.

13) Steam and water droplets rise to the tops of the pipes or boiler walls and are collected in this steam drum. Here the water settles and pure steam is left. The temperature here is approximately 1000° F. and the pressure is approximately 1800 psi. Because you are standing on top of the boiler, it is noisy and hot.

14) In this view of the outside, all the steps which we have discussed are visible. Fuel from the tanks or pipes in the background is pumped into the large box-like boiler on the 3 burner decks. Air is blown in at the bottom. Chemical energy is converted to thermal energy in the fire. The thermal energy is then converted to mechanical energy as the water boils. The steam then rises to the drum at the top of the building and travels down the silver pipes to the . . .

15) turbines. The long building houses the turbine and generator assembly. The tracks and crane are used to lift and move parts for repairs.

16) The turbine is a long set of fan blades that turn as the steam rushes over them. The valves which control steam flow are closest to us, then the small high pressure blades, and finally the larger low pressure blades.

17) Here a real turbine is being inspected for wear.

18) Notice the many rows of blades.

19) Here you can see how each blade is carefully curved.

20) As the turbine turns, another set of blades remain stationary.

21) These fixed blades are curved in the opposite direction from the others and are placed so that the steam flow is straightened. This causes the turbine to turn even faster.

22) At the other end of the long building is the generator.

23) It is attached to the same shaft as the turbine, and generates the electricity as it spins.

24) The electricity goes into the switching yard where it is stepped up for transmission and its final destination is determined.

25) The red lines on this map of Southeast Kansas show the various routes that the electricity could take after passing through the switching yard, but this does not finish the story. What happens to all that steam after it spins the turbine?

Murray Gill Slides

26) Here large coolers called condensers carry the steam from the turbine and turn it back into water. This water is called condensate. All yellow pipes carry condensate.

27) Here blue pumps are used to pump the condensate through yellow pipes back to the boiler to be reused.

28) Large cooling towers at this plant keep the condensers cool. Other plants may use rivers or ponds.

29) Water falls down the inside of the cooling tower and evaporates. This cools just like a wet towel waving in the breeze. In the cooling tower, the breeze is made by large round fans on the top of the tower.

30) The entire plant is run from the control room. Here an engineer records measurements from instruments. Behind him are other instruments which give readings from all over the plant. It is his job to monitor the dials and to make sure everything is running right.

31) To help him out, the instruments are grouped and color-coded just like the pipes in the plant. Every step that we have seen thus far is on the control panel. (Can you follow them?) The lights at the top go off like fire alarms when something is wrong.

32) We have seen one unit in an electrical generating plant. The Murray Gill plant has four units. (Can you identify all of the parts?)

FIELD TRIP PLAN

This Field Trip Plan form is offered for your convenience in an effort to insure that the activity will not only go as smoothly as possible, but be interesting and educationally applicable.

Energy Adventure Center Staff

Teacher________________ Grade Level________ Room_______________

1. Trip Information: Destination_________________________________

Day and Date_______________ Transportation: School Bus___ Car___

If private cars, does insurance of all vehicles meet B.O.E. Policy requirements? Yes _____ No _____

Leaving Time_______________ Returning Time_____________________

Brief description of what the students will see and do.

____

____

____

____

2. Preparation:

A. Unit of study or activity with which the trip correlates.

____

B. Specific objectives of the trip.

1)____

2)____

3)____

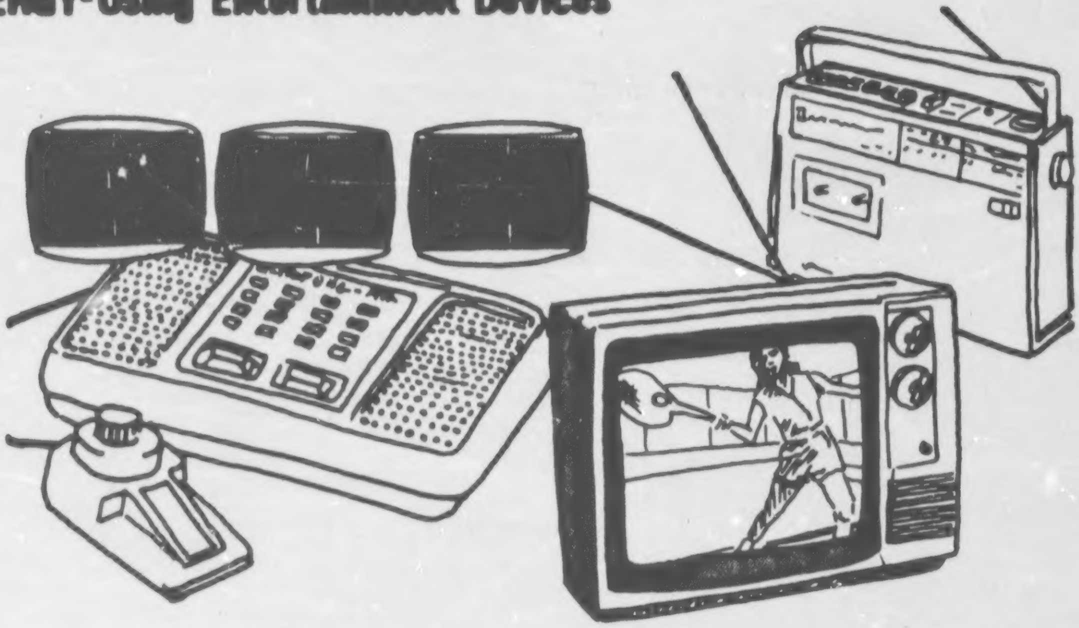
C. Follow-up Activity.

____

____

____

ENERGY-Using Entertainment Devices



Instructions:

Students use this check sheet at home to keep a record of how many hours they spend using each entertainment device.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

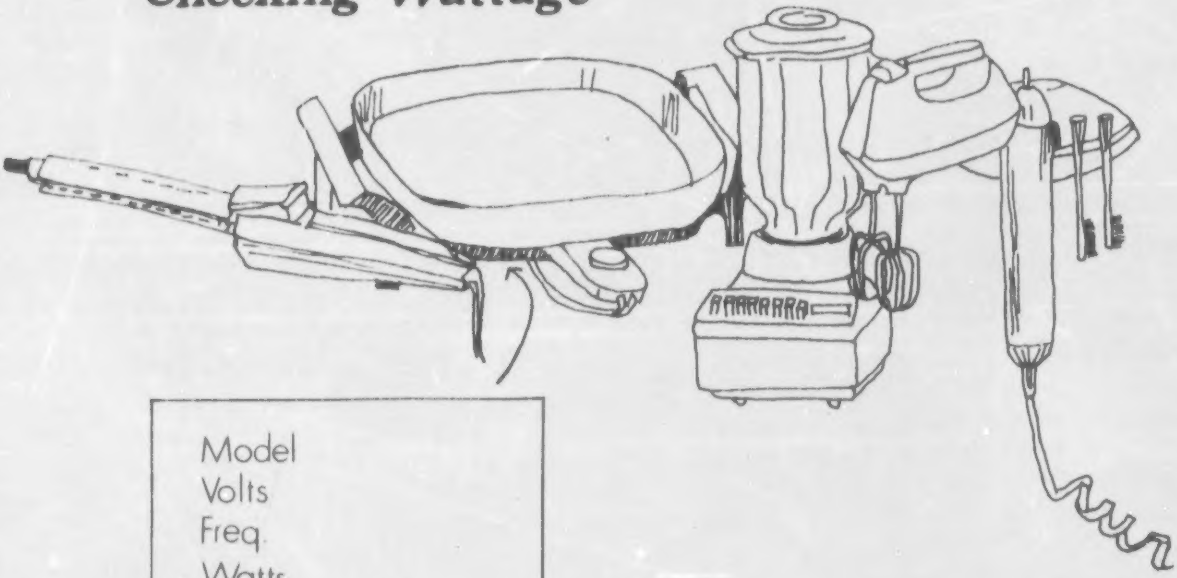
4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

ENERGY-Using Entertainment Devices

Device	Hours of use per day						
	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
Black and White TV							
Color TV							
Radio, Tape Player, and Stero							
Electrical Games (TV games, football, model trains, cars, ect.)							
Electrical Instruments (Guitar, ect.)							
Slide Projector							
Movie Projector							
Other:							

Checking Wattage



Model
Volts
Freq.
Watts

Instructions:

On each appliance is some information which tells the amount of power being consumed. The wattage is just such an indicator. The children may take each appliance and look for the label which tells how many watts the item uses. If an appliance is not labeled in watts but in amps and volts, the children may still find watts by multiplying volts times amps.

Notes:

Which of the following questions could be answered with this activity?

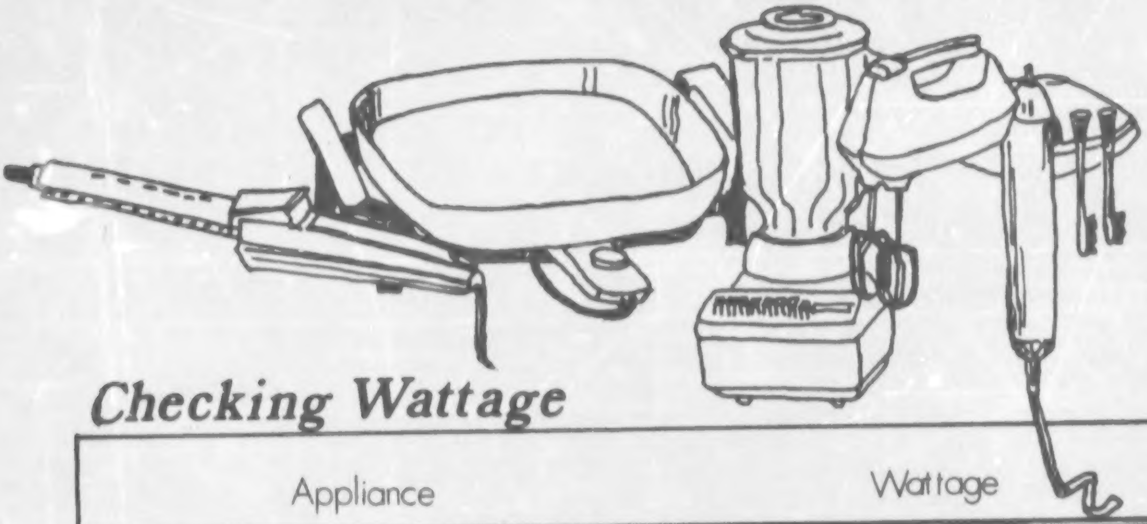
1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?



Checking Wattage

Appliance	Wattage
Blender	
Can Opener	
Electric Knife	
Slow Cooker/Crock Pot	
Electric Skillet	
Electric Toothbrush	
Hair Dryer	
Hot Plate	
Water Pik	
Food Processor	
Toaster	
Waffle Iron	

WHICH WATTS COUNT?

Record for one week how many minutes you (or your family) use these household appliances. Later total the wattage for the week and compare it to the estimated kilowatt hour consummed annually column.

Appliance	Average Wattage	Minutes of Use							Weekly Total	Est. kwh Consumed Annually
FOOD PREPARATION		S	M	T	W	T	F	S		
Blender	386									15
Broiler	1,436									100
Carving Knife	92									8
Coffee Maker	894									106
Deep Fryer	1,448									83
Dishwasher	1,201									363
Egg Cooker	516									14
Frying Pan	1,196									186
Hot Plate	1,257									90
Mixer	127									13
Oven, Microwave (only)	1,450									190
Range										
with oven	12,200									1,175
with self-cleaning oven	12,200									1,205
Roaster	1,333									205
Sandwich Grill	1,161									33
Toaster	1,146									39
Trash Compactor	400									50
Waffle Iron	1,116									22
Waste Disposer	445									30
FOOD PRESERVATION										
Freezer (15 cu. ft.)	341									1,195
Freezer (frostless 15 cu. ft.)	440									1,761
Refrigerator (12 cu. ft.)	241									728
Refrigerator (frostless 12 cu. ft.)	321									1,217
Refrigerator/Freezer (14 cu. ft.)	326									1,136
Refrigerator/Freezer (Frostless 14 cu. ft.)	615									1,829
LAUNDRY										
Clothes Dryer	4,856									993
Iron (hand)	1,008									144
Washing Machine (automatic)	512									103
Washing Machine (non-automatic)	286									76
Water Heater	2,475									4,219
Water Heater (quick recovery)	4,474									4,811

Appliance	Average Wattage	Minutes of Use							Weekly Total	Est. kwh Consumed Annually
		S	M	T	W	T	F	S		
COMFORT CONDITIONING										
Air Cleaner	50									993
Air Conditioner (room)	860									860*
Bed Covering	177									147
Dehumidifier	257									377
Fan (attic)	370									291
Fan (circulating)	88									43
Fan (rollaway)	171									138
Fan (window)	200									170
Heater (portable)	1,322									176
Heating Pad	65									10
Humidifier	177									163
Health & Beauty										
Germicidal Lamp	20									141
Hair Dryer	381									14
Heat Lamp (infrared)	250									13
Shaver	14									1.8
Sun Lamp	279									16
Tooth Brush	7									0.5
Vibrator	40									2
HOME ENTERAINMENT										
Radio	71									86
Radio/Record Player	109									109
Television										
black & white tube type	160									350
black & white solid state	55									120
color tube type	300									660
color solid state	200									440
HOUSEWARES										
Clock	2									17
Floor Polisher	305									15
Sewing Machine	75									11
Vacuum Cleaner	630									46

---

*Based on 1000 hours of operation per year. This figure will vary widely depending on area and specific size of unit.

The following formulas will help you compute your watt hours and and kwh, if desired:

$\frac{\text{watts} \times \text{minutes}}{60}$ = watt hours $\qquad$ $\frac{\text{watts} \times \text{time}}{1,000}$ = kwh

Questions:

1. Could you reduce or limit the amount of household appliances you use?
2. Could you reduce the amount of time you use these appliances?
3. What could you substitute for these electric appliances?
4. In what area of your home do you use the most electricity - food preparation, food preservation, laundry, comfort conditioning, health and beauty, home entertainment or housewares?
5. How much energy was used to produce these appliances?

ELECTRIC SKILLET vs ELECTRIC RANGE BURNER

The purpose of this activity is to prepare food both on top of the range and in an electric fry pan and then compare the quality of the food, the convenience of each appliance, and the cost and amount of energy used in each case. If you were to operate a burner and a fry pan for one hour which would use more electricity?

Prepare a recipe of pancakes. Bake half in an electric fry pan, the other half in a fry pan on the top of the range. Now compare the energy used.

electric burner = ______________ watts

electric fry pan = ______________ watts

Using the following formula, compute the kwh (kilowatt hours) needed for using the burner one hour.

$$\frac{\text{watts}}{1{,}000} \times \text{hours} = \text{kwh}$$

Use the same formula to compute the kwh needed for using the electric fry pan one hour.

electric burner = ______________ kwh

electric fry pan = ______________ kwh

(You may also compute the minutes of use rather than one hour if desired.)

Compute the cost of each method of cooking if a kwh costs 4¢.

The electric fry pan used ______ kwh at 4¢ per kwh, it cost _______.

The range burner used ______ kwh at 4¢ per kwh, it cost _______.
(Note: Electric burner usually is about 2,750 watts; electric fry pan usually is about 1,250 watts.)

Compare the two methods of baking the pancakes according to the following criteria:

	Electric Fry Pan	Top of Range
1. Quality of pancakes		
2. Convenience		
3. Cost of energy used		
4. Amount of energy used (kwh)		

Summary Questions

1. What would be the advantages and disadvantages of each appliance?
2. What would be the difference in the amount of energy needed to produce each appliance?
3. What is the difference between the amount of energy used by an electric and gas stove.
4. Why would an electric burner use twice as much electricity as a frying pan?

By doing this activity, I learned ________________________________

____

____

____

____

____

____

The World's Greatest Whole Wheat Pancakes

2 cups whole wheat flour
2 cups milk (Buttermilk is goooood!)
2/3 tbsp. baking powder
2 or 3 eggs, separated

Beat the egg whites until fluffy. Stir all the other ingredients together. Fold in the egg whites.

We serve with butter and hot honey, but sour cream and jam is also good.

"Sunday Morning Pancake Maker"
Earl F. Griffith

EASY WAYS TO SAVE ENERGY IN YOUR KITCHEN

When cooking, try to bake several dishes at once in the oven.

Pre-heating an oven isn't necessary unless they contain a leavening agent.

Check the operation of your oven with a thermostat to see if the thermostat is accurate.

If you are purchasing a gas oven or range, look for one with an automatic (electronic) ignition system intead of pilot light.

Never boil water in an open pan.

Keep range-top burners and reflectors clean.

Match the size of the pan to the heating elements.

In hot summer months plan meals that require little cooking - salads, sandwiches, etc. Do more things outdoors - cookout in the fresh air - barbecue. Avoid heating your home with the oven or stove.

Keep refrigerator/freezer full, defrost promptly (allow no more than 1/4 inch of frost build-up) and be sure door gaskets or seals fit tightly, (enough to hold a dollar bill when the door is closed).

Open your refrigerator door as little as possible during hot weather.

If you're buying a refrigerator, its energy economical to buy one with a power-saver switch.

If you use a dishwasher - pre-rinse dishes in cold water; open door after final rinse cycle to let dishes air dry. Remember: Hot water temperature need not be more than 120° to wash dishes effectively.

Use cold water rather than hot to operate your food disposer. (Hot water allows grease to coat the inside of the pipes.)

Install an aerator in your kitchen sink faucet.

Keep appliances in good working order. When buying appliances, shop comparitively. Compare energy use information and operating costs of similar models by the same and different manufactures.

Before buying new appliances with special features, find out how much energy they use compared with other, perhaps less convenient models.

Use appliances wisely; use the one that takes the least amount of energy for the job.

Check for labels on appliances showing estimated annual operating cost now required on major appliances by the Federal Energy Administrations and Federal Trade Commission's Energy Policy and Conservation Act.

Use light and electrical appliances as little as possible - confine the heavy cooking stoves, washers, dryers, and showers to the early morning and evening hours.

Wash clothes in warm or cold water, rinse in cold water.

Save energy by using solar drying, the old-fashioned clothesline.

Avoid articles made from synthetic fibers. Their source are petrochemicals. If there's "poly","vinyl", or "petro" in a substances name, a portion of that product came from an oil well, and there's a 50% chance that well was on foreign soil.

Checking Wattage

Objectives: Students will review energy forms and converters.

Students will be able to determine the amount of electricity (watts) used by various appliances.

Students will be able to calculate how many watts of electricity an appliance uses when the word "watts" is not shown on an electrical appliance.

Students will be encouraged to investigate how much electricity is used by the appliances they have at home.

Materials needed: The cart of electrical appliances, a large meter, the light board, copies of the wattage check worksheet, and pencils.

Special instructions: Arrange the room so that the electrical appliances are on tables so that they can be handled by the students. Have the meter plugged into a wall socket so that it can be used for demonstration.

I. Review forms of energy and converters

A. Use the electrical appliances as visuals. Have the students tell what forms of energy are represented in each appliance.

1. Blender - electrical, mechanical, sound
2. Can opener - electrical, mechanical, sound
3. Electric knife - electrical, mechanical, sound
4. Slow cooker - electrical, thermal
5. Electric skillet - electrical, thermal
6. Electric toothbrush - electrical, mechanical, sound
7. Hair dryer - electrical, mechanical, thermal, sound, radiant
8. Hot plate - electrical, thermal, radiant
9. Water pik - electrical, mechanical, sound
10. Food processor - electrical, mechanical, sound
11. Toaster - electrical, radiant, thermal
12. Waffle iron - electrical, thermal

B. Converters - Review with the students that each of the items is a converter. In each case the electrical form of energy is converted into another form. See section A above for those forms.

II. Discover the amount of electricity used by each appliance

A. Ask the student to guess which appliance uses the greatest amount of electricity and to tell why they think as they do. Some common responses are:

1. Slow cooker - size and the fact that it has to be operated for such a long time in cooking food.
2. Food processor - it takes a great deal of energy to chop, slice or dice food.

    3. Electric skillet - it has to get very hot to cook food.

B. Ask the students to guess which of the appliances uses the least amount of electricity. Some common responses are:

    1. Toaster - it isn't used for a great length of time.
    2. Toothbrush - it is so small.
    3. Water pik - it doesn't take much energy to pulsate water against your teeth.

C. Ask the students whether or not they think that if the appliances were all operated for the same length of time (an hour, for instance) they would use the same amount of electricity. They generally say that they don't think they do and their response is correct.

D. Ask the students to turn the appliances over so that they can look for the word WATTS. Sometimes it is abbreviated to the letter W. We use the word watt when we measure the amount of electricity used by an appliance.

E. Ask the students to look for a number in front of the word WATTS. That tells how many watts of electricity the appliance uses each hour. Example: A hundred watt lightbulb uses 100 watts of electricity each hour.

F. Sometimes the word WATTS will not be on the appliance. In that case, find the words AMPS and VOLTS or the letters A and V and multiply the numbers with them. That will give an answer in close approximation to the number of watts.

    1. Example: 120 Volts and 2.8 Amps

```
  120
X 2.8
  960
 240
336.0   OR 336 WATTS
```

    2. The can opener and the water pik will be worked this way.

G. Have the students then fill in the worksheet. You may wish to have them wander around the room to look at all of the appliances so that they will have the practice of looking for the number of watts themselves.

H. After the students have finished their worksheets, have them share their answers with the rest of the class. Hold a discussion on the different appliances that surprised the students either because they used so many or so few watts of electricity. Were their predictions correct in A and B of this section?

I. Have the students circle the names of the five appliances that use the greatest amount of electricity. They should circle the electric skillet, the hot plate, the toaster, the blender and the waffle iron.

    1. Ask the students to study the circled appliances and suggest something that all but the blender have in common. (They convert electrical to thermal.)

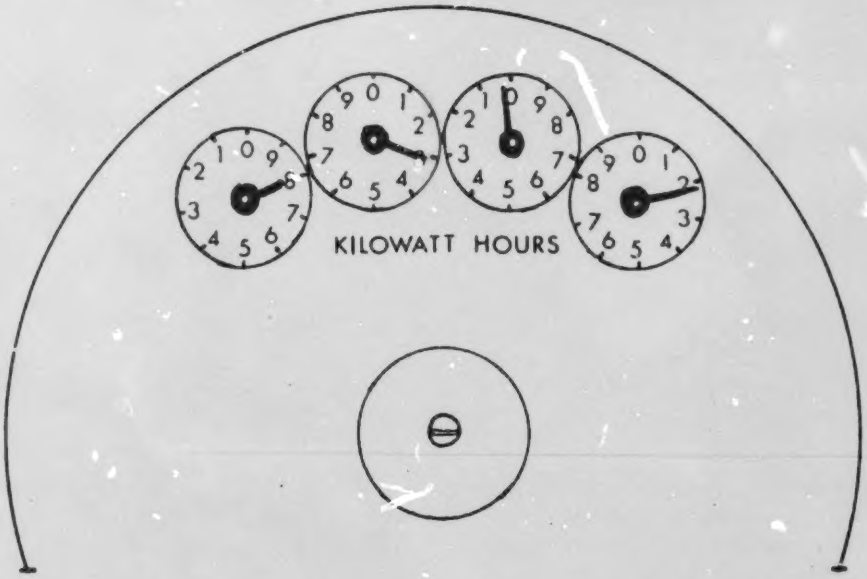
2. A lot of electricity must be used to heat objects.

III. Use the large meter to show how the electricity we use is recorded.

A. Ask the students whether or not they have a meter at home. It is interesting that some students are not aware that they have meters and will answer no to the question.

B. Ask the students why there are meters on their houses. Many students will suggest that the meter helps them know how much electricity they are using. Some will suggest that the electric company wants to know how much electricity people are using so that they can be billed for the electricity they use.

C. The meter does not record the number of watts of electricity used, but rather the number of kilowatts. People pay for electricity by the kilowatt. One kilowatt equals 1,000 watts.



D. The dials are read as you would read any number by place value. Example: This drawing represents 8,302 kilowatts. The 8 is in the thousands place; the 3 is in the hundreds place; the 0 is in the tens place; and the 2 is in the ones place.

E. When the meter is running (which is most all the time) the dials move in the direction the numbers progress from 0 - 9. Notice that the far right dial runs clockwise, the next dial runs counterclockwise, the next clockwise and the last counterclockwise. The dial to the far right will move the fastest since it records only kilowatts. The one to the far left moves the slowest because it records thousands of kilowatts.

F. Have the students watch as you plug one of the electrical appliances into the meter. They will be able to see the disk in the center of the meter spin, but they will not be able to see the dials turn. The appliances would have to operate for quite a long time for even one kilowatt to be recorded.

   1. The students can see a dramatic difference in the amount of electricity that is used if you plug in the electric skillet which uses over a kilowatt of electricity (1255 watts) in an hour first and then plug in the toothbrush which only uses five watts in an hour. Notice how quickly the disc spins when you plug in and operate the skillet and how slowly it spins when you operate the toothbrush.

IV. Light board

A. The light board is a popular way to demonstrate the conservation of energy by turning off lights when they are not needed.

B. The board has two kinds of light bulbs: incandescent and fluorescent.

   1. Incandescent lights are perhaps the more familiar, bulb shaped ones. They become very hot when the light is on.

   2. Fluorescent light bulbs are shaped like tubes. Each foot of lightbulb uses 10 watts of electricity. A four foot fluorescent bulb would therefore be a forty watt bulb.

   3. The fluorescent bulb on the light board is a fifteen watt bulb. It is a foot and a half in length.

C. Plug the light board into the meter. Turn on all of the light bulbs and watch the disc spin on the meter. Notice how it slows down as the light bulbs are turned off. The students can directly observe how much electricity is wasted when unneeded light bulbs are left on.

D. Compare the amount of light given off by the fifteen watt flourescent bulb and by the twenty-five watt incandescent bulb. Which gives more light? Which would be the more energy efficient light bulb? Why?

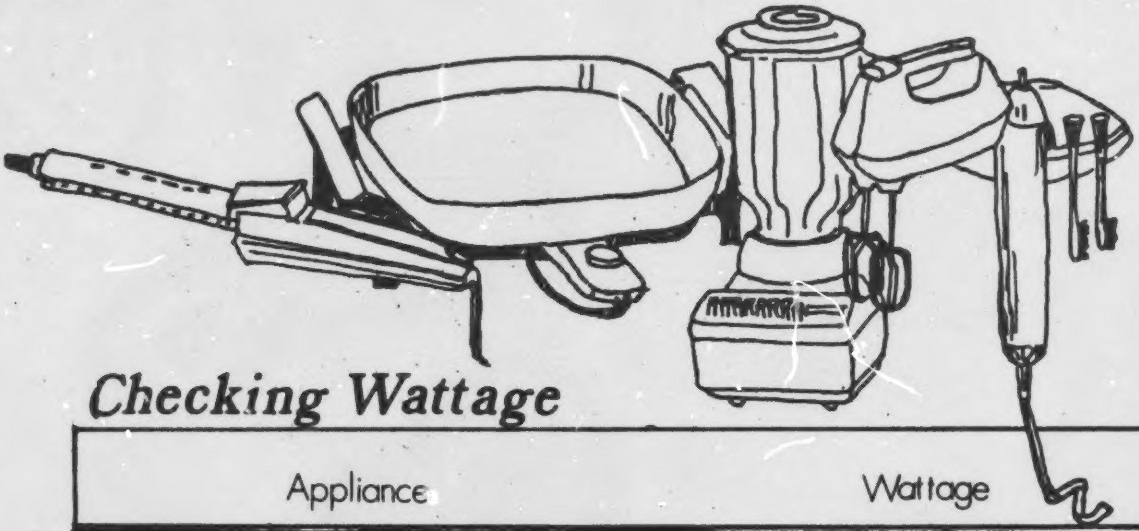
V. Conclusion

A. This lesson has been designed to help students become aware of how to tell how much electricity is used by various electrical appliances and light bulbs. The teacher might want to involve the students in some follow up activities.

   1. Make a chart of the electrical appliances you use at home and the number of watts used by each.

Checking Wattage

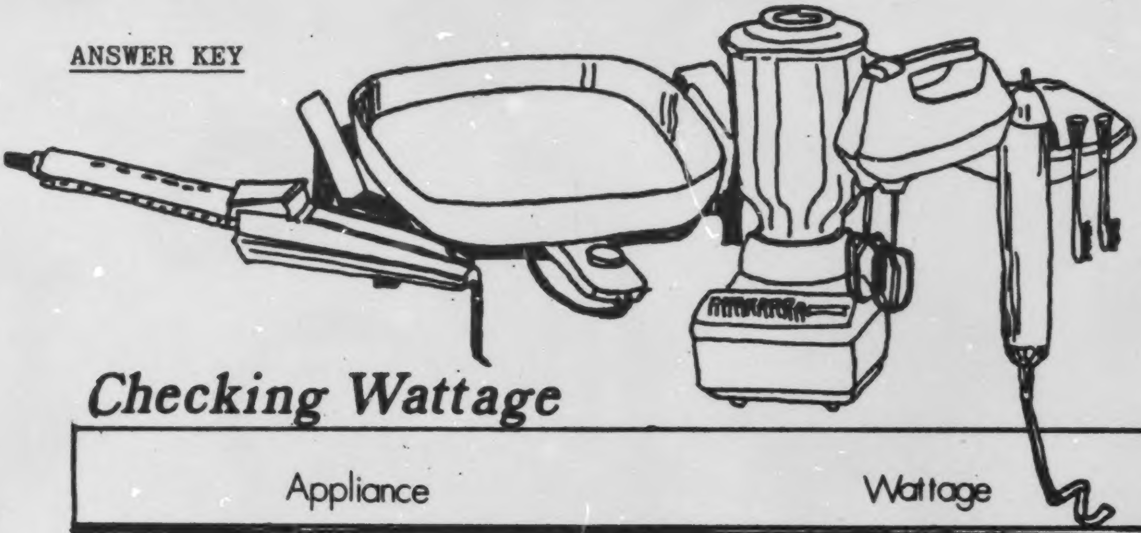
2. Compare the number of watts used by different hair dryers, different toasters, etc. Do they all basically use the same number of watts? What might cause the difference in the number of watts used?
3. Choose an electrical appliance you use every day. Find out how many watts of electricity it uses. Multiply the watts by the number of hours you use the appliance to see how many watts of electricity you used totally. Divide that number by 1000 to see how many kilowatts of electricity you used.
4. Compare several electrical appliances that could be used to cook a food item. Measure how much electricity would be used to cook that item of food by each of the appliances. Which appliance would be the most energy efficient?



Checking Wattage

Appliance	Wattage
Blender	
Can Opener	
Electric Knife	
Slow Cooker/Crock Pot	
Electric Skillet	
Electric Toothbrush	
Hair Dryer	
Hot Plate	
Water Pik	
Food Processor	
Toaster	
Waffle Iron	

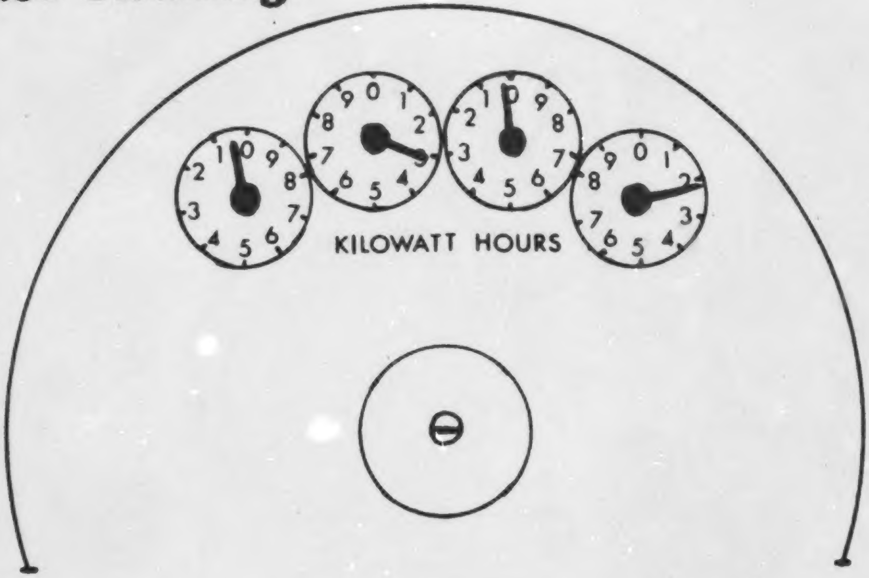
ANSWER KEY



Checking Wattage

Appliance	Wattage
[✓ Blender]	720
Can Opener 120 x 1.8	216
Electric Knife	130
Slow Cooker/Crock Pot	80-160
[✓ Electric Skillet]	1,255
Electric Toothbrush	5
Hair Dryer	350
[✓ Hot Plate]	1,110
Water Pik 120 x .8	96
Food Processor	150
[✓ Toaster]	1,050
[✓ Waffle Iron]	700

Meter Reading


1 0 9 8 7 6 5 4 3 2
9 0 1 2 3 4 5 6 7 8
1 0 9 8 7 6 5 4 3 2
9 0 1 2 3 4 5 6 7 8
KILOWATT HOURS

INSTRUCTIONS:

DIRECTIONS FOR READING THE METER ARE ON THE MODEL. BE SURE TO WATCH THE WAY THE HAND MOVES ON THE DIAGRAM AS INDICATED BY THE ARROW. THE DIAL ON THE FAR RIGHT RUNS CLOCKWISE; THE NEXT DIAL RUNS COUNTER CLOCKWISE. THIS PATTERN IS REPEATED WITH THE NEXT TWO DIALS.

NOTES:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

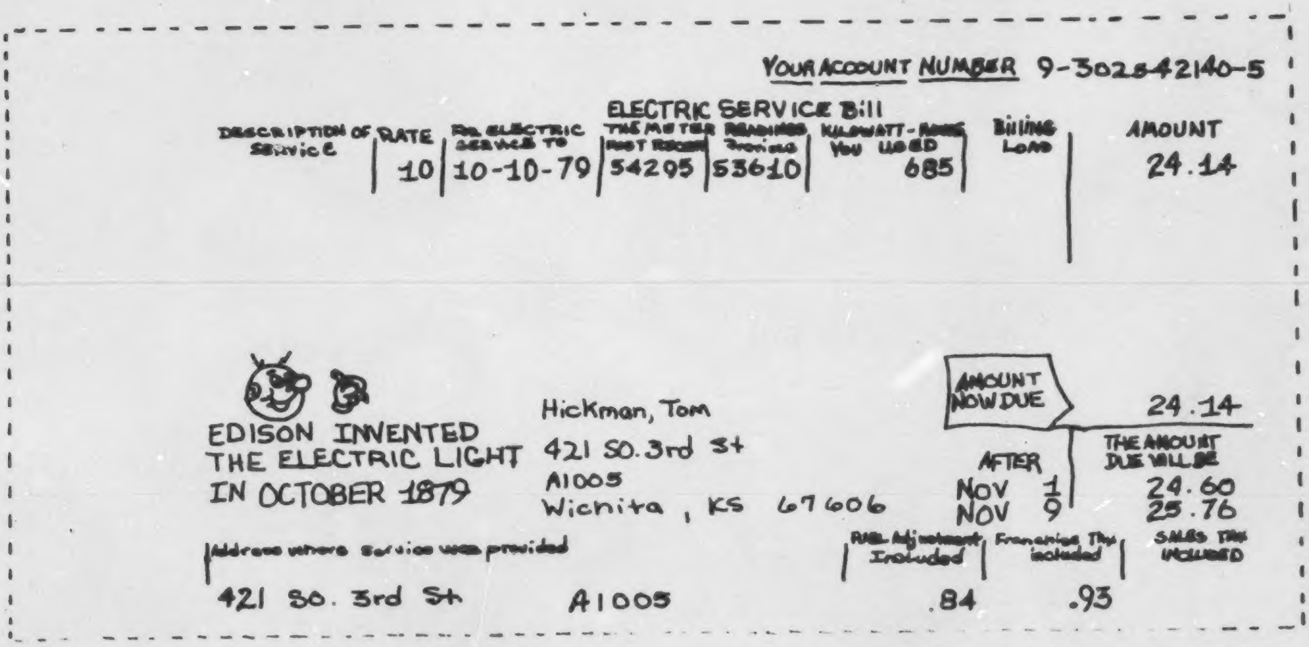
5. How could this activity change the individual's use of energy?

READING AN ELECTRIC BILL

The amount of electricity used in your home for a period of time can be studied by reading the monthly electric bill. Below is an example of an electric bill.

In order to find how much electricity you used for that period, look under kilowatt hour used. Now multiply the amount of electricity by the rate or price of electricity per kilowatt hour (kwh). The result would be the approximate amount used from the previous date the meter was read to the most recent date. This is "approximate" because sometimes the companies that supply your electric service have to add on certain other costs, like taxes.

Looking at the sample electric bill try to answer the following questions:



YOUR ACCOUNT NUMBER 9-302542140-5

ELECTRIC SERVICE Bill

DESCRIPTION OF SERVICE	RATE	FOR ELECTRIC SERVICE TO	THE METER READINGS MOST RECENT	THE METER READINGS Previous	KILOWATT-HOURS YOU USED	Billing LOAD	AMOUNT
	10	10-10-79	54295	53610	685		24.14

EDISON INVENTED
THE ELECTRIC LIGHT
IN OCTOBER 1879

Hickman, Tom
421 SO. 3rd St
A1005
Wichita, KS 67606

AMOUNT NOW DUE 24.14

AFTER	THE AMOUNT DUE WILL BE
NOV 1	24.60
NOV 9	25.76

Address where service was provided		Fuel Adjustment Included	Franchise Tax included	SALES TAX INCLUDED
421 SO. 3rd St	A1005	.84	.93	

READING AN ELECTRIC BILL

Questions

1. How does the electric company know how many kilowatt hours you used?

2. What date was the meter read to determine the kwh used for this billing?

3. What was the present reading?

4. What was the past reading?

5. How many kwh were used? (You may subtract past from present to find kwh used.)

6. What was the total amount of this bill?

7. Were there any additional costs? If so, how much were they and for what purpose.

Extra Credit Suggestions:

Find the cost per kwh in your community by calling your local electrical company.

Develop ways and practice decreasing your electric bill at home.

Graph monthly bills and discuss why there may be increases or decreases.

Study your school electric bills and discuss them.

Compare the difference between gas and electric bills?

EAC

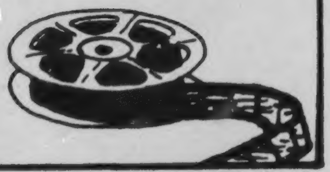
PRESENTS

NATURAL GAS

No. 1724

19 min.

16 mm.



INSTRUCTIONS:

THIS FILM WILL HELP THE STUDENTS:

1. BECOME AWARE OF THE NATURAL GAS SHORTAGE.
2. RECOGNIZE THE PROBLEMS OF NATURAL GAS DISTRIBUTION.
3. RECOGNIZE THE PROBLEMS OF NATURAL GAS DEPLETION.
4. DISCUSS THE DEREGULATION OF NATURAL GAS PRICES.

NOTES:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

PRESENTS

ATOMIC ENERGY: INSIDE THE ATOM

13 min. No.0553

Instructions:

This film will help the students:

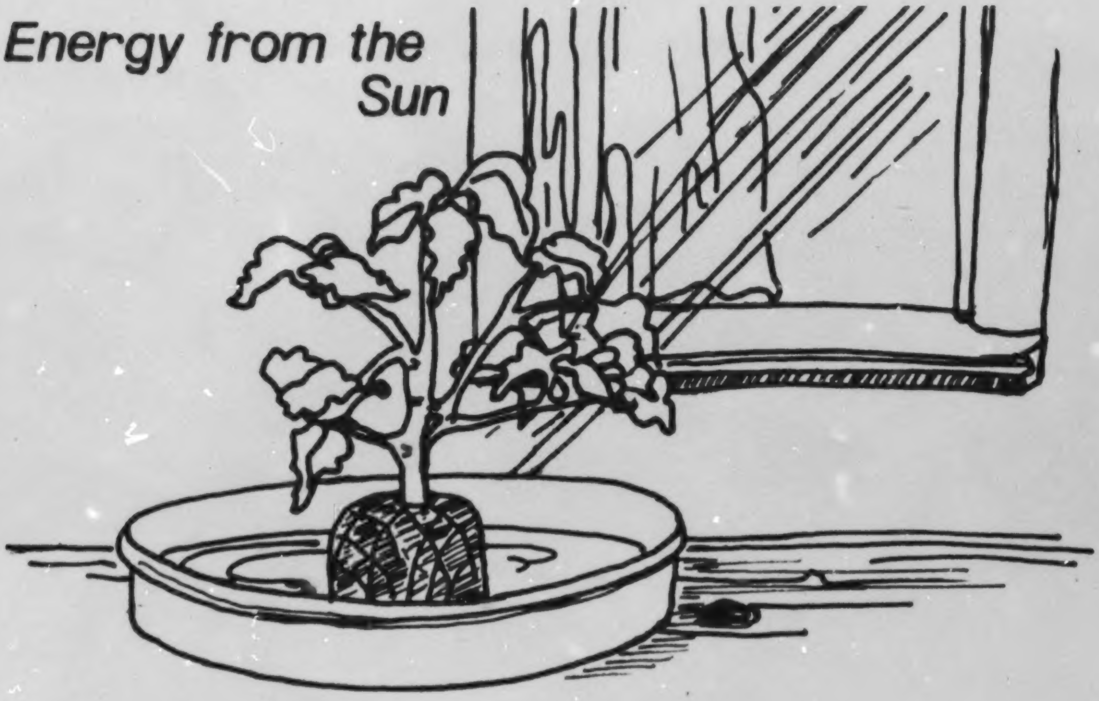
1. Visualize (through animation) the structure of the atom.
2. Recognize the atom's affect on the cloud chamber and the geiger counter.
3. Observe the atom's use in a hospital, an atomic power plant, and an atomic submarine.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?
2. What forms are being converted?
3. What resources are being used?
4. What changes could this activity mean for society?
5. How could this activity change the individual's use of energy?

Energy from the Sun



Instructions:

Place the compressed peat pot in a dish of water and watch it expand. Plant a seed of any kind in the peat and set it in a sunny spot. Keep it moist, and if there is a favorable growing atmosphere the seed should start to grow.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

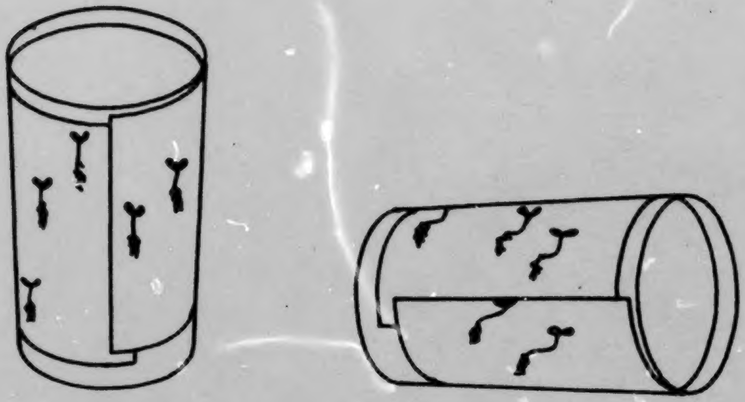
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Sun Glasses



Materials Needed:

- Small clear glass or baby food jar
- Construction paper
- Radish seeds

Instructions:

1. Cut a strip of construction paper to sufficient width and length so that it fits snugly around the inside of the glass.
2. Moisten the paper.
3. Pull the top edge of the paper back and drop several radish seeds in between it and the glass. The moist paper will hold the seeds in place.
4. After the seeds sprout, lay the glass down. Have students note any change in the direction of growth.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

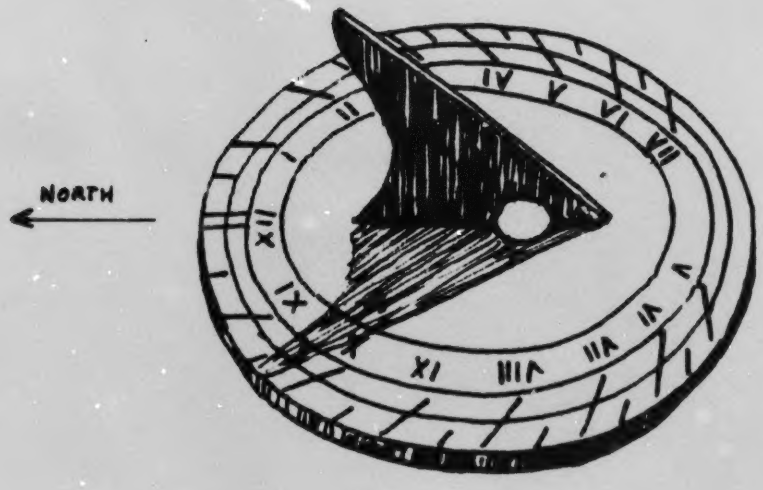
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Sundial



Instructions:

Place the sundial on a sunny, level area. Rotate the sundial until the high end of the slanted gnomon points directly north. The edge of the gnomon's shadow will fall on the face plate and the time can be read from the Roman numerals on the face plate. During daylight saving time, one hour should be added to the reading on the face plate to get the correct time.

Sundials are not as accurate as modern clocks so the times may not always be the same (especially early and late in the day). All sundials will give the same reading, however, and are useful as a standard of time.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

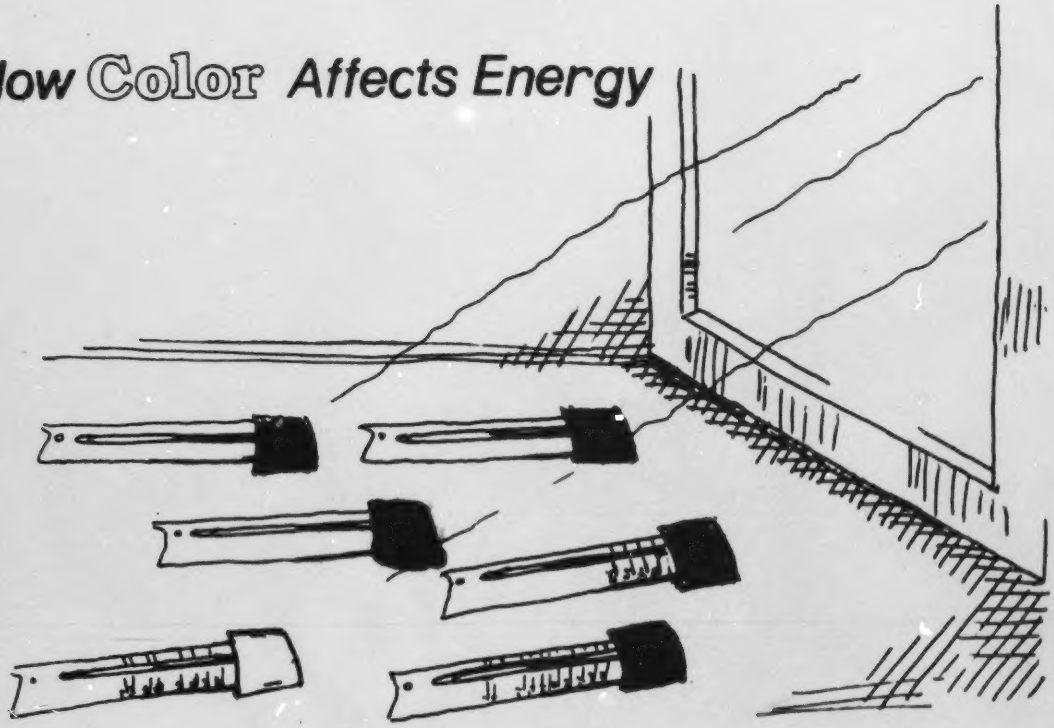
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

How Color Affects Energy



Instructions:

Construct seven or eight cubes (2½" X 2½") out of different colors of construction paper. Be sure to have a white cube and black cube along with assorted colors. Poke a hole in one side and insert a thermometer into each. Then set each cube in full sunshine. Take readings every 15 minutes to determine heat absorbing and/or reflecting quality of each color.

Variation: Make pockets from color paper and put a thermometer in each pocket. To make the pockets, cut strips of various colored paper wide enough to cover a thermometer bulb. Fold to cover the bulb and tape or staple. Use same procedure to obtain readings as described above.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

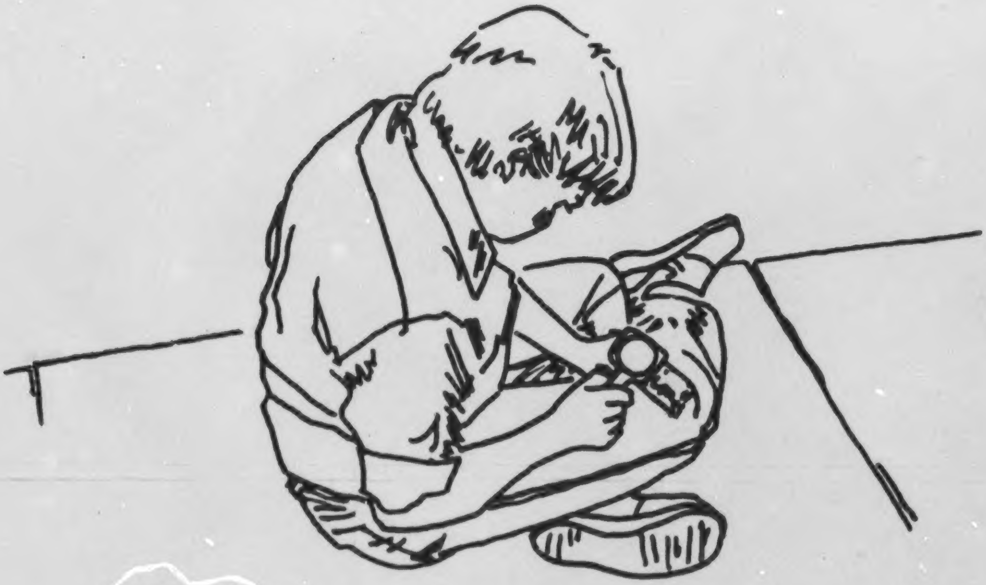
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Solar Woodburning



Instructions:

Get a flat piece of wood and draw a design on it with a pencil. Using a magnifying glass, focus the sun's rays on the wood. A small circle should appear. The smaller the circle is the quicker the wood will start to burn. Try not to cast a shadow over the magnifying glass or wood.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

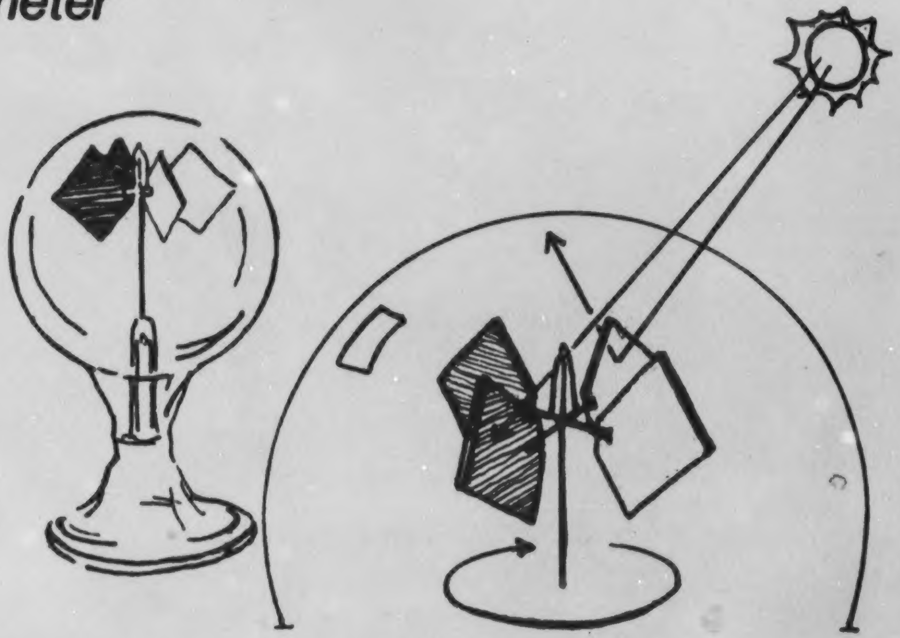
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Radiometer



Instructions:

Radiometers are driven by the heat generated when light strikes the black vanes. This expands the air next to the vane in the partial vacuum, and the expanding air drives the vane around. The white side of the vane absorbs less light and moves into the light easily.

Hold the radiometer to a light source. Observe the speed of rotation with respect to distance from the light source, different angles from the light, and different types of light.

Light sources of different kinds can demonstrate various light energies. The speed of the rotating vanes shows how much energy is contained in the light.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

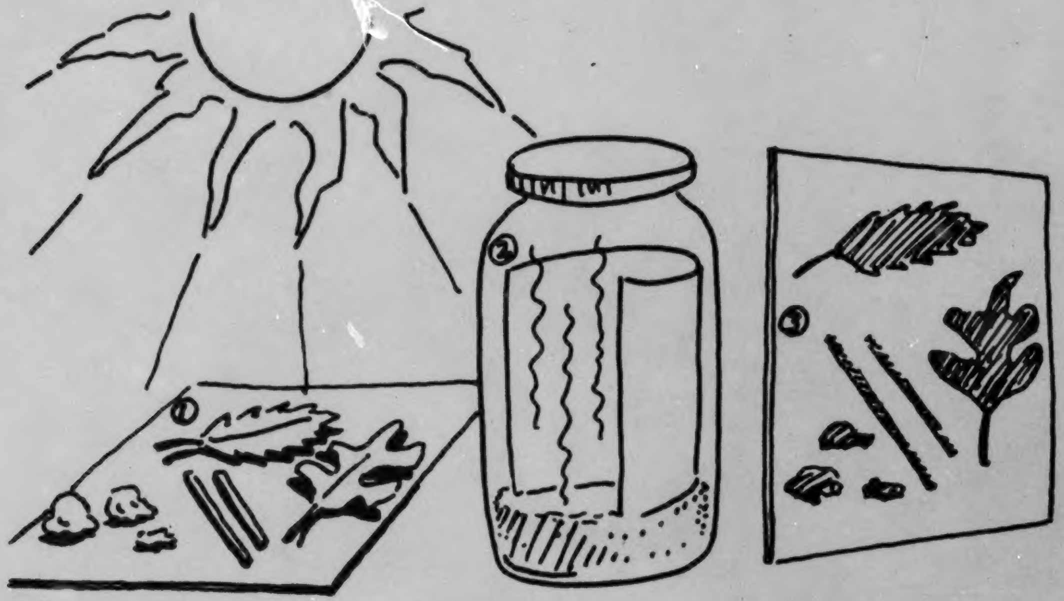
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Solar Prints



Instructions:

Solar energy does many things for us that we take for granted. A solar print is a good way to illustrate this. Solar prints, or photograms, are photographs made without cameras or darkroom. They provide outdoor groups with an interesting method of experimenting with solar energy and of viewing plants or animals in the environment. It's fun and easy to make solar prints -- try it!

1. Pour enough ammonia into the one-gallon jar to cover the bottom.
2. Pour approximately 2 cups of sand or gravel into the jar and mix with the ammonia.
3. Set the jar in a grocery bag to prevent strong light from penetrating it.
4. In the shade of your body, remove one sheet of Blackline paper and arrange objects on the paper. (You may wish to cover the objects with a clear plate or plastic food wrap to hold the objects flat against the paper.)

Solar Prints

5. Step aside and expose the paper to direct sunlight for 30-60 seconds.
6. Pick up the paper and quickly put it into the jar. Put the cover on the jar and allow the paper to develop until the image appears.
7. If the solar print takes too long to develop or appears too weak, shake up the gravel in the jar to reactivate the ammonia fumes. If this doesn't help, add more ammonia.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

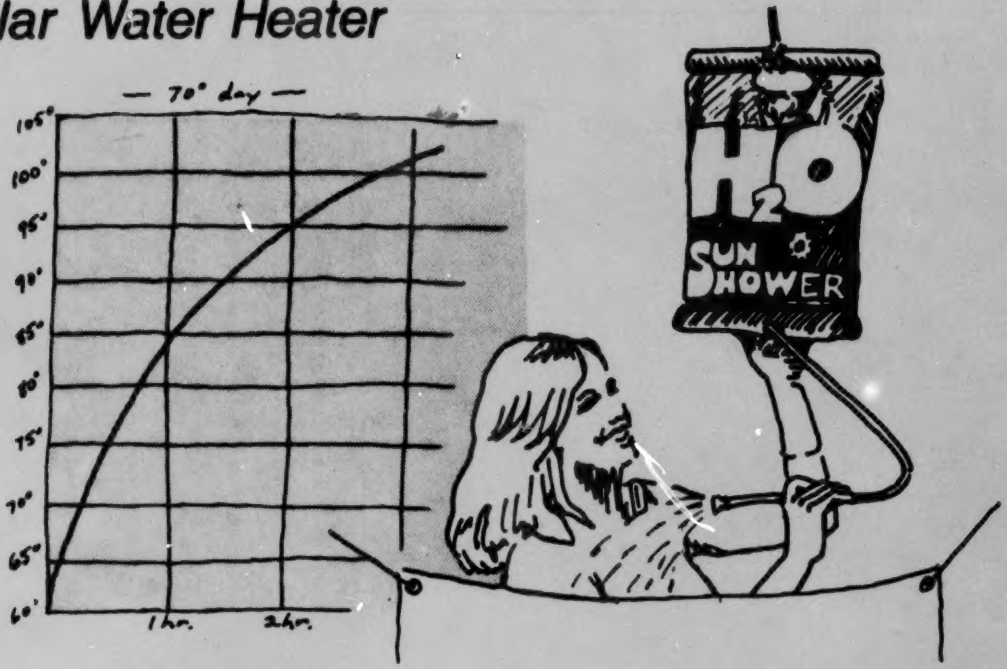
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Solar Water Heater



Instructions:

The solar water heater shows conversion from radiant energy to thermal energy. Sunlight entering the transparent window heats the plastic, and the heat is transferred to the water.

Fill the heater with 2 to 2½ gallons of water. Insert a thermometer and take an initial reading. If you're careful, the thermometer can be dropped inside and readings can be taken through the clear plastic. Lay the heater on a flat surface with the clear side exposed to sunlight. Take occasional readings as the water heats up over several hours. These readings can be graphed and compared for different outside temperatures, different amounts of light, etc.

The center of the flower design on the front of the heater is temperature sensitive. Its color will shift to blue when water temperature is over 34°C. Check water temperature before using as water may be hot enough to burn (over 49°C).

Which of the following questions could be answered with this activity?

1. What is energy doing?

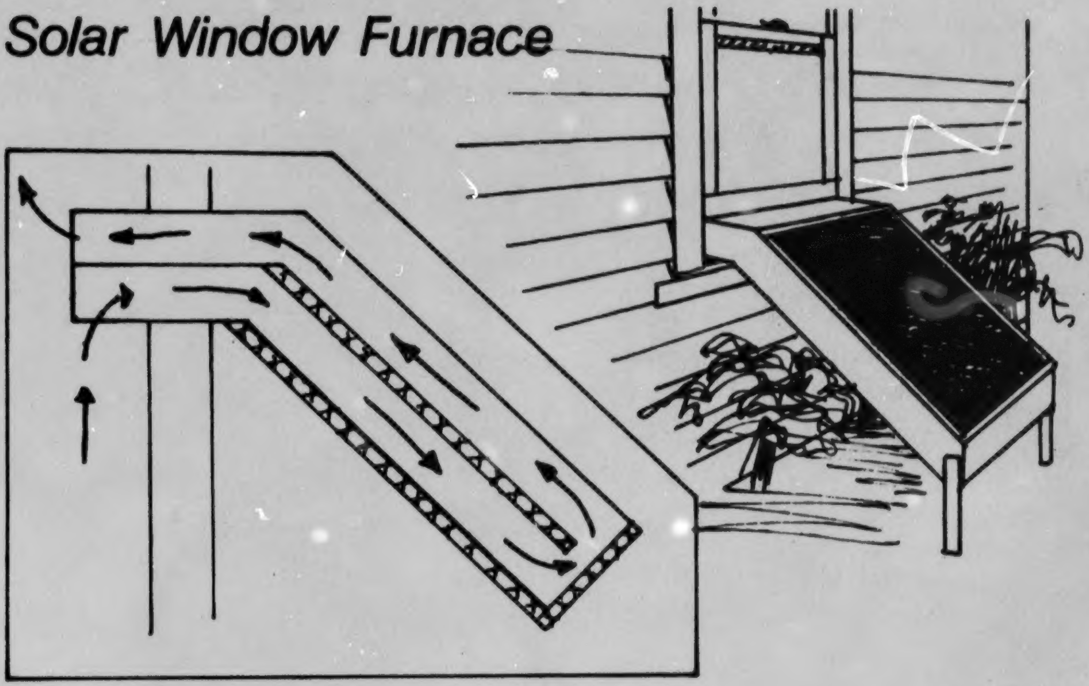
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Solar Window Furnace



Instructions:

The purpose of the furnace is to heat a room with solar energy. Cool air enters the furnace at the bottom, is heated by the sun, and exits through the top to heat the room.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

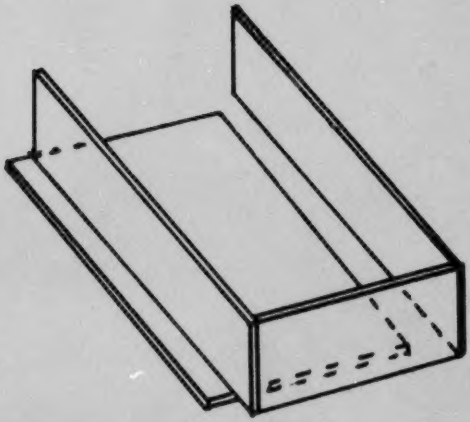
5. How could this activity change the individual's use of energy?

Passive Solar Heating

Instructions:

I. The Lower Box

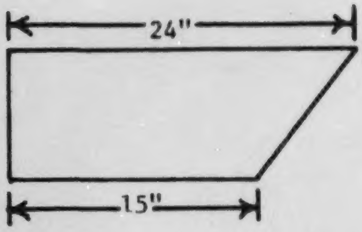
1. Cut two sides 48" long from 1" x 12".
2. Cut one end piece 34 1/2" long from 1" x 12".
3. Cut one bottom piece 36" x 48" from 3/8" plywood or similar material.
4. Screw or nail the sides, end, and bottom together as shown.



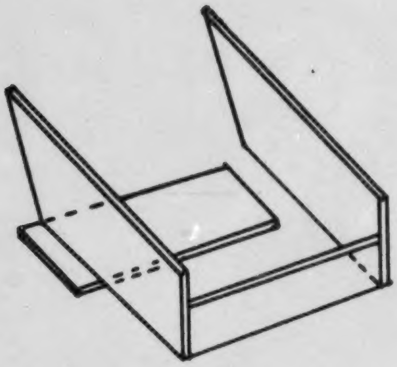
5. Caulk all seams.
6. Line the entire interior of the box with 1" insulation.
7. Paint the interior flat black.
8. Cut one glazing piece 36" x 48" from suitable material (Plexiglas, Filon, glass, etc.).

II. The Upper Box

1. Cut two sides from 1" x 8" as indicated in the diagram.



2. Cut one end piece 34 1/2" long from 1" x 4".
3. Cut one bottom piece 10" x 36" from 3/8" plywood or similar material.
4. Screw or nail the sides, end, and bottom together as shown.



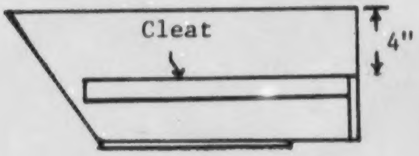
5. Caulk all seams
6. Cut one top piece 24" x 36" from 3/8" plywood or similar material.
7. Paint interior of all pieces flat black.

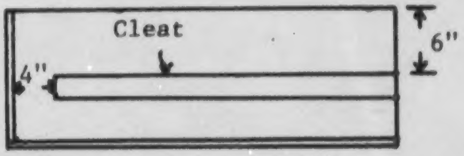
III. The Collector Surface and Upper Air Flow Divider

1. Cut the following from 5/8" foil faced Thermax insulation board or its equivalent.
   - a) one collector surface 32 1/2" x 42".
   - b) one upper air flow divider 19 1/2" x 34 1/2".
2. Cut the following from 1" x 2".
   - a) two collector surface cleats 41" long.
   - b) two divider cleats 19" long.
3. Paint all pieces flat black.

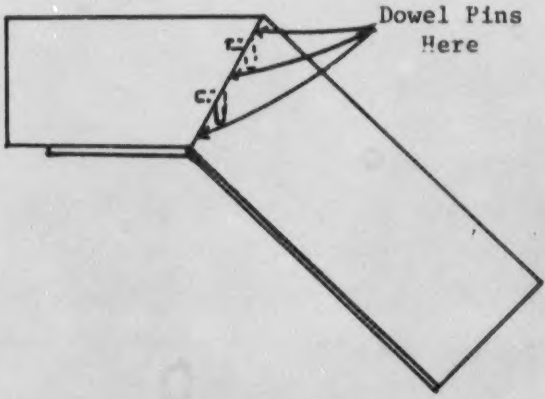
IV. Assembly

1. Screw or nail the collector surface cleats and the divider cleats to the sides of the upper and lower boxes as shown.

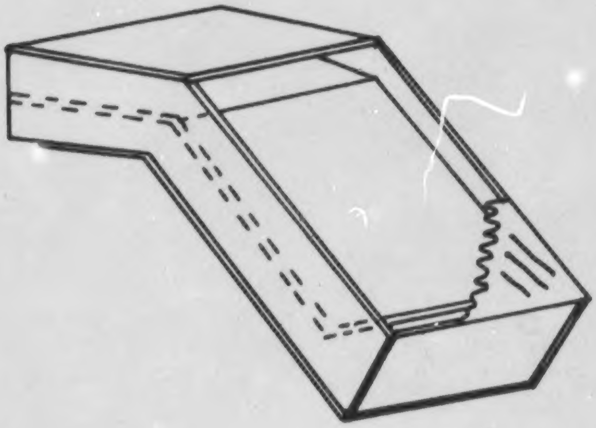




2. Attach the lower box to the upper box as shown using 3/8" dowel pins. Glue liberally. Add "L" braces to the inside for extra strength.

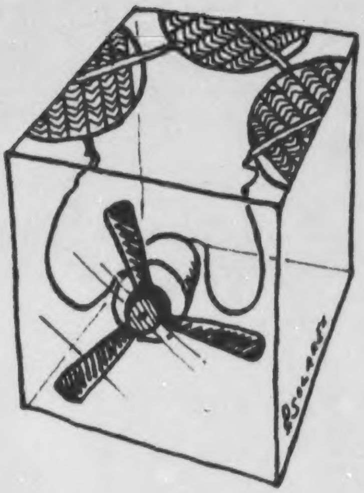


3. Screw or nail the upper air flow divider (foil side up) to the cleats.
4. Add the collector surface (foil side up) making certain that it meets the upper air flow divider and that there is approximately a 4" space at the bottom for air circulation.
5. Caulk all seams.
6. Screw or nail the upper box top and the glazing to the window furnace. Be sure to use weatherstrip or caulk to ensure a tight seal.



Note: The length and width dimensions may be adjusted to fit the window. However, you must be careful to maintain the proper solar angle. A good rule of thumb is to find your latitude in degrees and add 13. For Wichita this is 50°. The plans take this into account and it will be maintained if the ratio of the lengths of the upper box sides is not changed.

Photovoltaic Cube



Instructions:

The photovoltaic cube demonstrates conversion of radiant energy to electrical energy to mechanical energy. It shows that with photovoltaic or solar cells sunlight can be converted into electricity to power small electrical motors or charge small batteries. Due to the high expense of these cells, their use, though practical, is limited to space craft, remote electrical stations such as telephones and radios, day and night light switches, electric eyes, etc.

Hold the cube up to a light source and observe the fan rotating. Observe speed of rotation with different light sources, intensity variations and at different angles of exposure to the light.

Photovoltaic cells are composed of very thin layers of material with electrical conductors (wire or foil) attached to the upper and lower surface. When light strikes the cell, electricity is caused to flow from the top layer through the wire and motor and into the bottom layer. This process will continue for hundreds or thousands of hours before the cube is "used up".

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

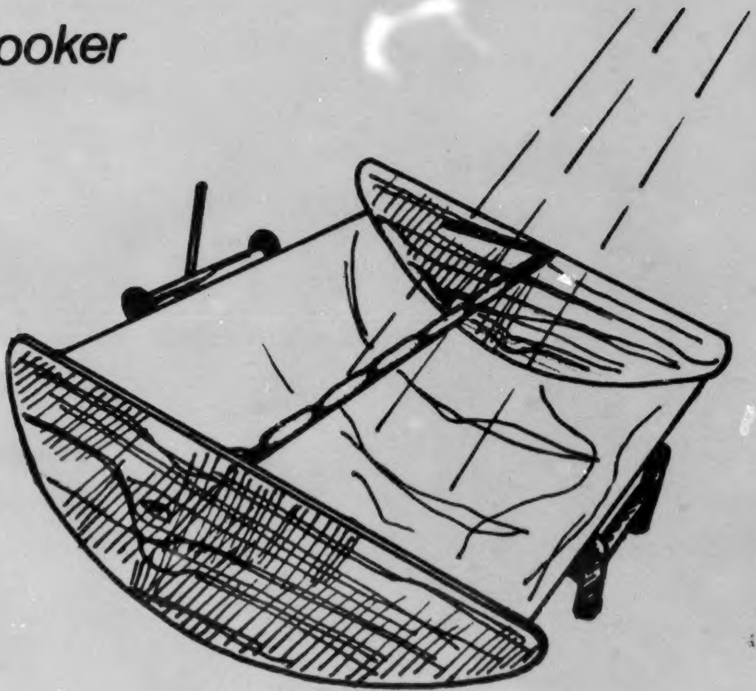
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Solar Cooker



Instructions:

The solar cooker is operated by aiming the entire unit toward the sun and focusing the sun's rays on the tray (i.e., the focal point). In order to do this, center the target shadow on the arrow at the bottom of the parabola. When the tray becomes hot cooking can be started.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

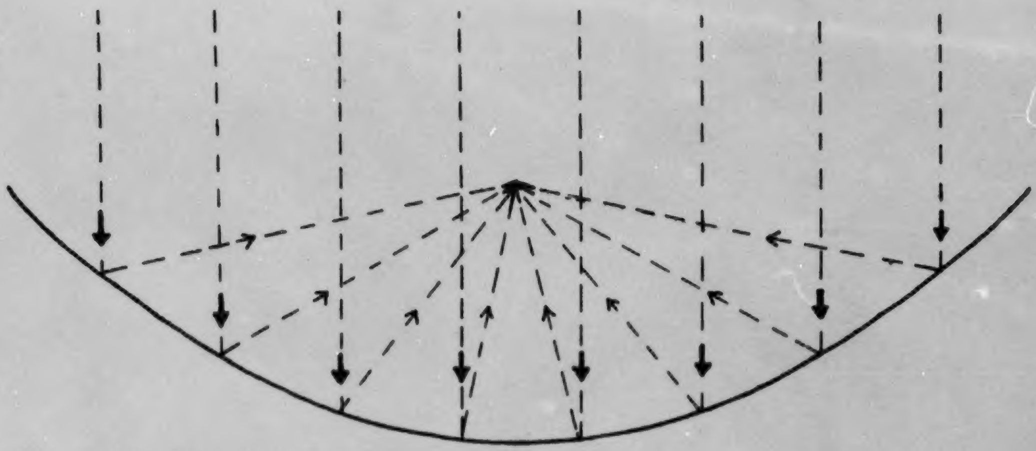
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

How to Draw a Parabola



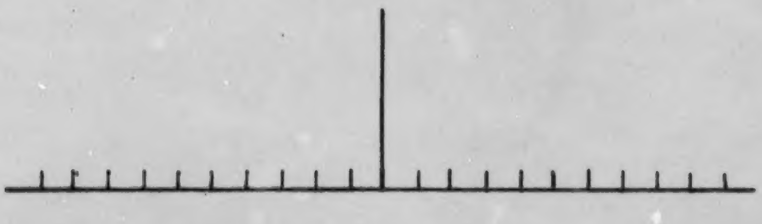
Instructions:

Use these instructions to make a parabola--a curved surface that focuses radiant energy on a certain area.

1. Make a base line.

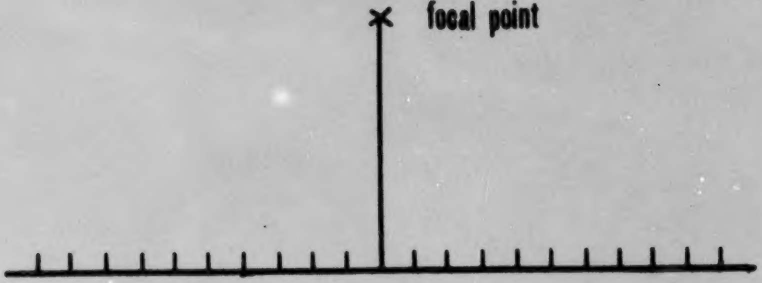
2. Mark it at 5mm intervals.

3. Find the center of the base line and draw a line perpendicular to it.

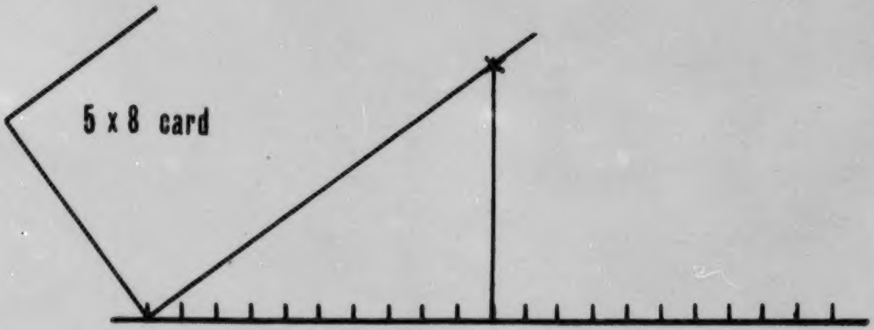


How to Draw a Parabola

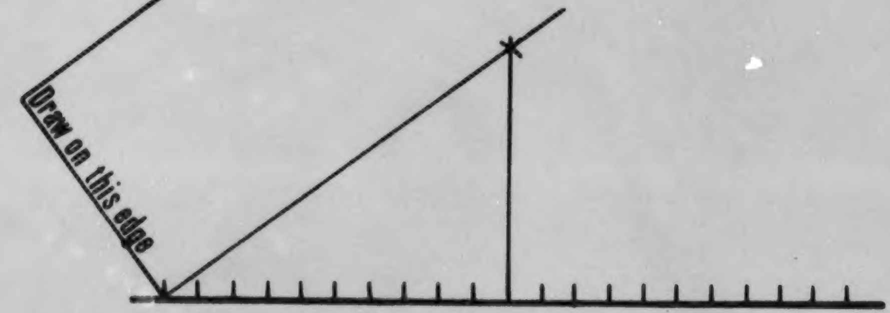
4. Make a focal point on this perpendicular line about 4 cm from the base.


focal point

5. Take something that has a right angle, like a 5 x 8 index card, and place a corner of it on one of the 5mm marks on the base line and align the edge on the focal point.

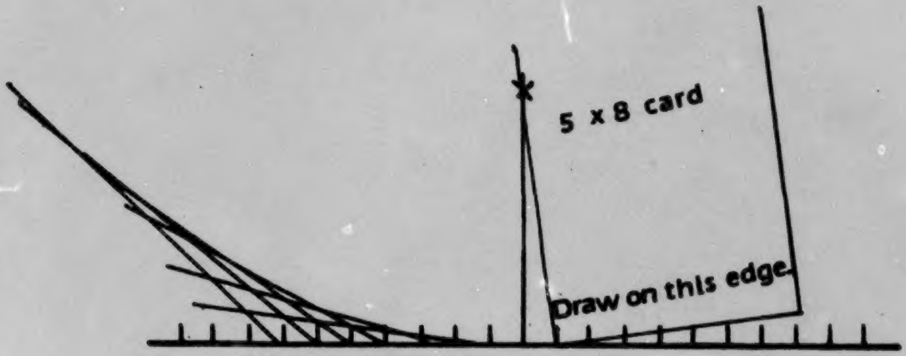


6. Draw a line along the base of the index card.

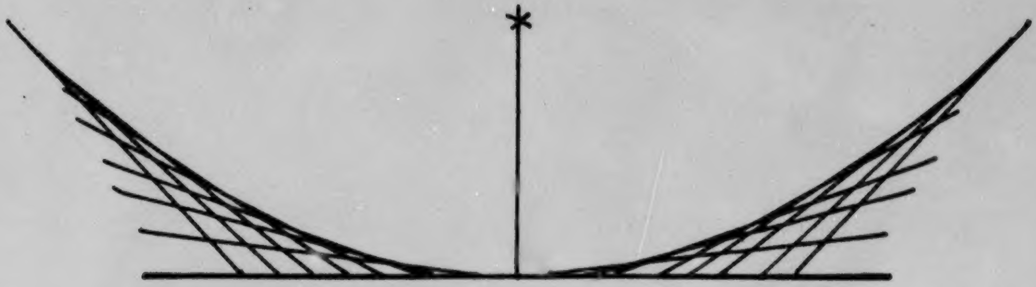

Draw on this edge

How to Draw a Parabola

7. Repeat for every point along the base line.


5 x 8 card
Draw on this edge

8. When you finish, you will have a parabola.



9. Try making another parabola. Move the focal point up or down and see what happens to the shape of the parabola.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

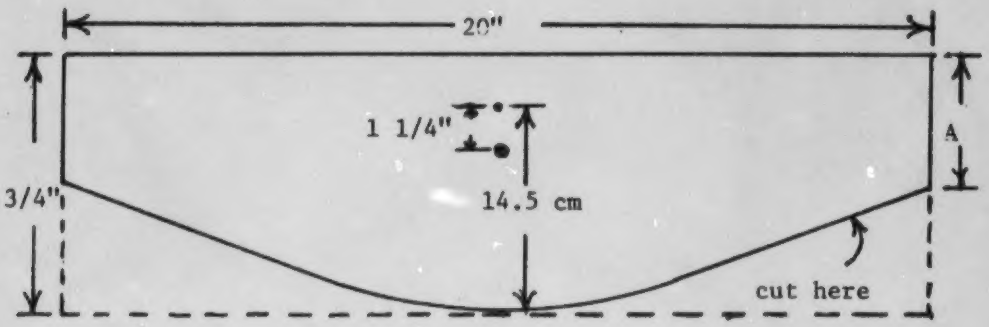
4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Solar Hot Dog Cooker

Instructions:

I. The Frame
   1. Cut a 20" x 7 3/4" rectangle out of 1/2" plywood or other suitable material.
   2. Using one of the 20" sides as a base line, draw a parabola with a 14.5 cm. focal point.*
   3. Drill a 1/8" hole at the focal point.
   4. Drill a 1/4" hole 1 1/4" directly below the focal point.
   5. Cut along the parabola line to make an end piece. Use this end as a template to make another.



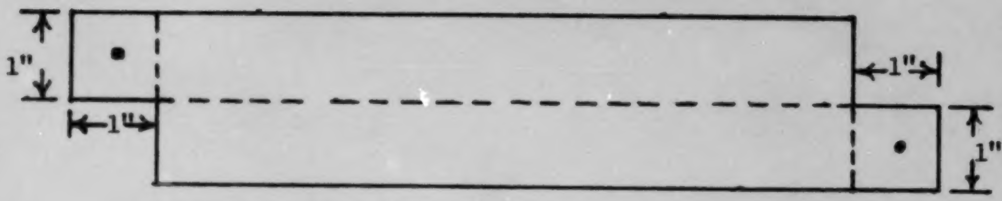
   6. Cut two stripes of 1/2" plywood (or whatever is being used) to desired length and the same width as dimension "A" in the diagram. This will be approximately 3 1/4".

*See EAC activity How to Draw a Parabola.

II. The Tray

1. Cut a strip of aluminum flashing 2" wide and long enough to fit snugly between the end pieces plus 2".

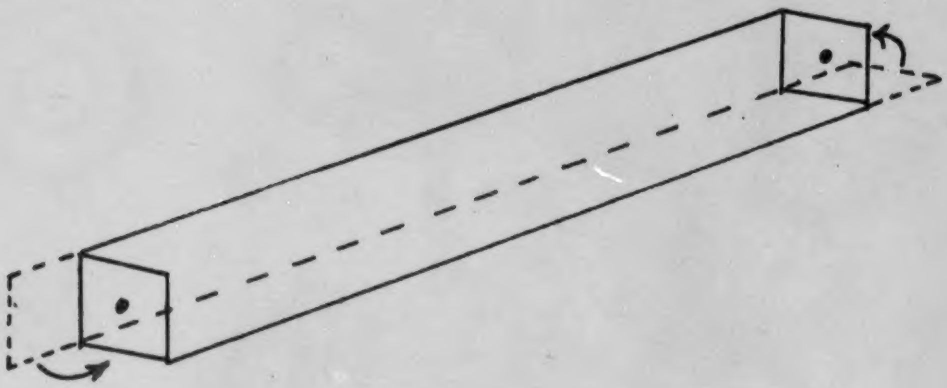
2. Notch the strip as shown in the illustration.



3. Drill 1/8" holes in the center of each and tab.

4. Score the aluminum strip as indicated by the dotted lines.

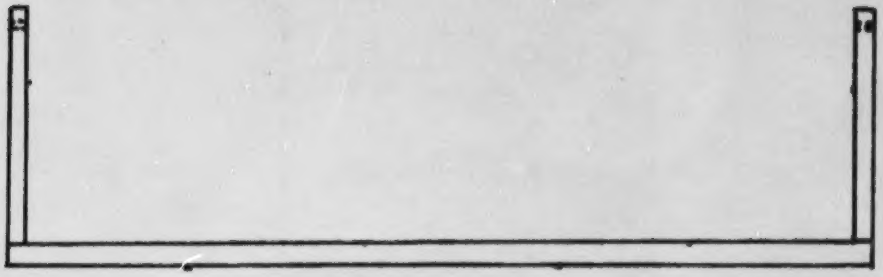
5. Fold the end tabs up and the tray into a "V" shape as shown.



Solar Hot Dog Cooker

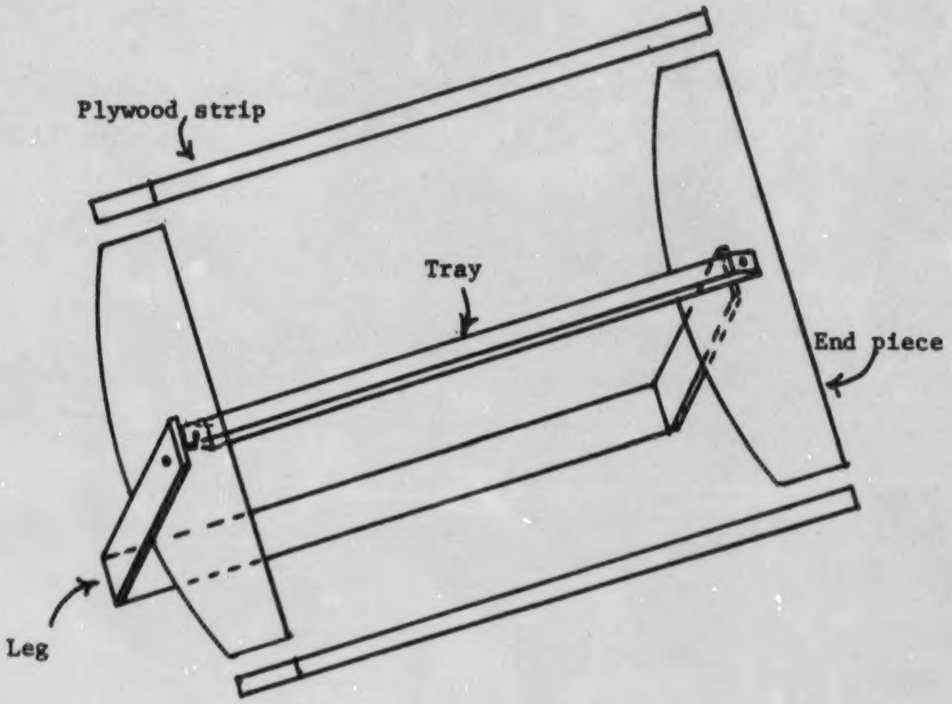
III. The adjustment leg.

1. Cut two pieces of 1" x 2" 11 1/2" long.
2. Drill a 1/4" hole 1/2" from the end of each piece.
3. Cut another piece of 1" x 2" 1 1/2" longer than the plywood frame strips which were cut earlier.
4. Nail or screw the long 1" x 2" to the two shorter pieces at the ends opposite the holes.

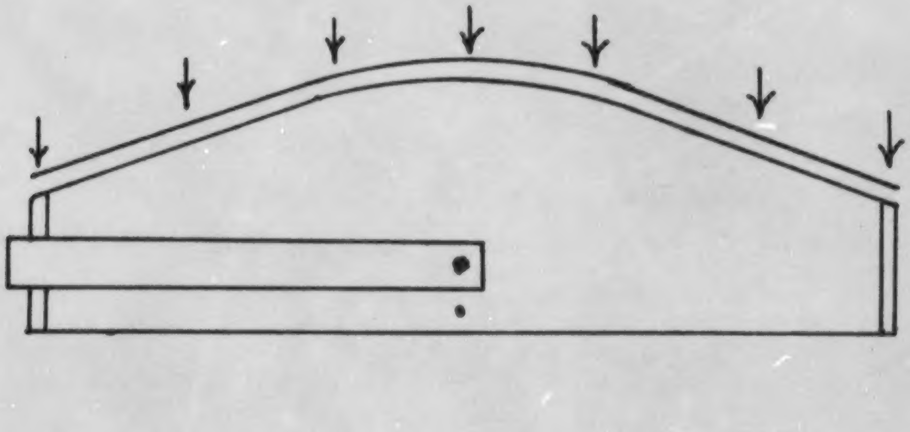


IV. Assembly

1. Nail or screw the plywood strips to the end pieces.
2. Attach the tray to the end pieces with 6 - 32 machine bolts.
3. Attach the adjustment leg to the end pieces with 1/4" machine bolts.

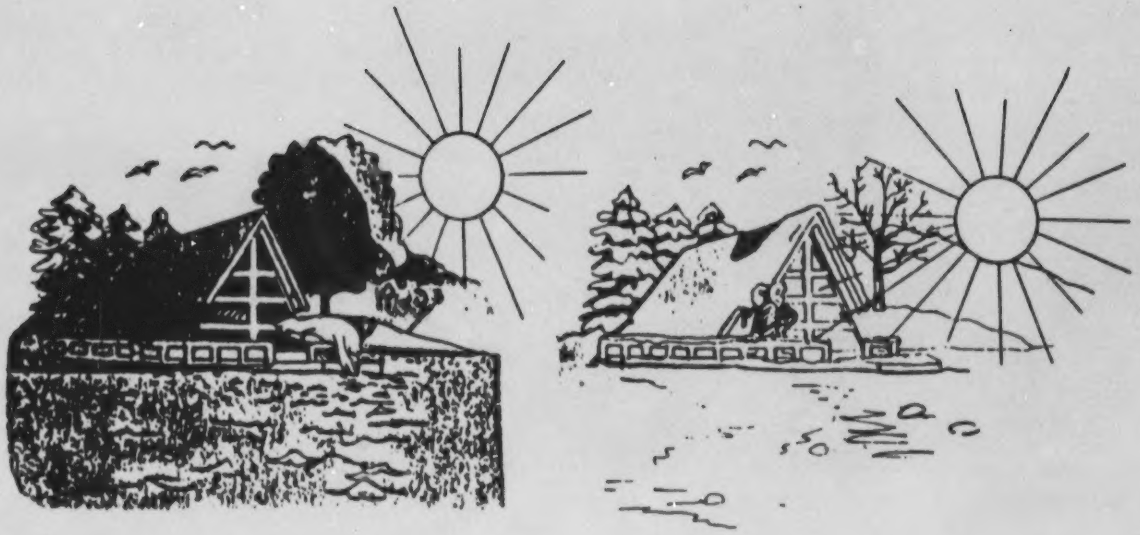

Plywood strip
Tray
End piece
Leg

4. Place hot dog cooker face down on a smooth surface. Attach reflective surface with staples, tacks, or small nails.



148

A PASSIVE SOLAR HOUSE



INTRODUCTION

Have you ever sat in front of a window and felt the sun's energy strike you? Windows in a house are very good solar collectors. They allow the sun's energy in and trap much of it so that little escapes. All you need is a window facing the sun and a method such as drapes for limiting its cooling surface when there is no sun.

This activity will have you consider ways to orient a house and landscape the lot to get maximum benefit from the sun's energy without using complex solar collecting systems. Be imaginative and you might be able to make suggestions to others which will help them more effectively utilize the sun's energy.

OBJECTIVES

At the completion of this activity, you should be able to:

- understand the basic features required in a simple passive solar heating design.
- apply your knowledge of vegetation to landscaping arrangements that conserve energy in buildings.
- apply your knowledge of the angle of the sun during different seasons to the problem of building design.

SKILLS AND KNOWLEDGE YOU NEED

- Basic cutting, taping and diagramming skills.
- The sun's rays strike the earth at a more shallow angle in winter than summer.
- Winter winds come from a particular direction in your locality.

MATERIALS

- Scissors.
- Tape.
- Straight edge.
- Worksheets A, B, and C.
- Light Source (filmstrip projector, lamp, etc.).

METHOD

1. Cut and fold the model dwelling and assemble without taping. (Worksheet A)
2. Place the folded model dwelling on the plot plan (Worksheet B) and decide on the setting of the dwelling. Make decisions about the room, windows and door placements. Unfold the dwelling and draw in the windows and doors.
3. Refold and tape the dwelling. Then tape the roof in place. Place the taped model dwelling on the plot plan. Cut out the model trees and shrubs and fold the bases. Use as many tree models as you desire to landscape the plots by taping the models in place. Remember, most deciduous trees lose their leaves in fall.

4. Set the light source at the approximate angles for the winter and summer sky. Check the effectiveness for winter heating and summer shading of your landscaped plot. Be sure to replace summer deciduous models with winter models and visa versa.

LOOKING BACK

You have designed and constructed a model home which will take advantage of the sun's energy when it is most needed. Your design should help you answer the following questions.

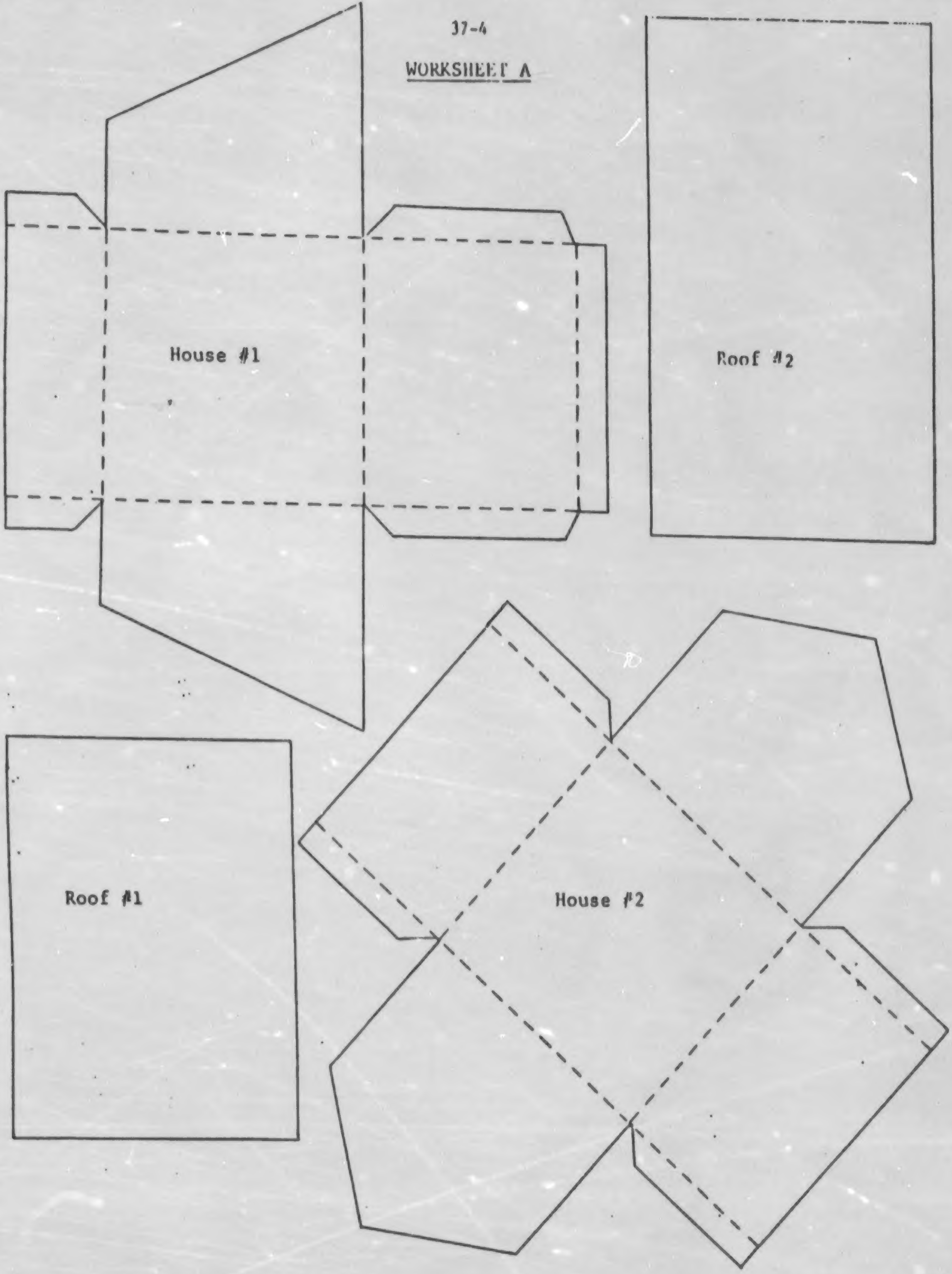
QUESTIONS

1. How does your dwelling compare to those of other students in placement of windows, size of doors and roof arrangements?
2. What are common procedures in landscaping passive solar homes?
3. In which direction should the largest roof overhang face to take advantage of winter sun while avoiding summer sun?

GOING FURTHER

- Obtain other copies of Worksheets A, B, and C. Redesign and landscape the same house for an active solar energy heating system. Place flat plate solar collectors on the roof. Determine the most efficient roof pitch for such a system and re-draw the sidewalls to obtain this pitch.
- Obtain other copies of Worksheets A, B, and C. Redesign the same house to include a cooling system, such as an evaporative cooling system. What factors will have to be considered for such a system?
- Construct a model home from other materials such as wood or plaster of paris incorporating various passive solar design features.

WORKSHEET A

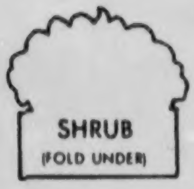

House #1
Roof #2
Roof #1
House #2

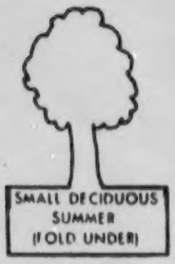
WORKSHEET B

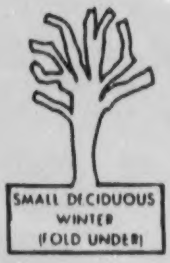
KEY

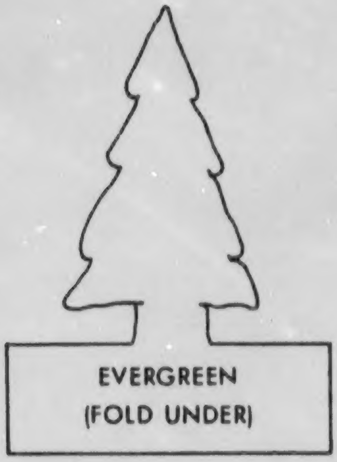
—o—o—o—o—	Fence (Indicate Height)
——— ———	Driveway
═══	Sidewalk

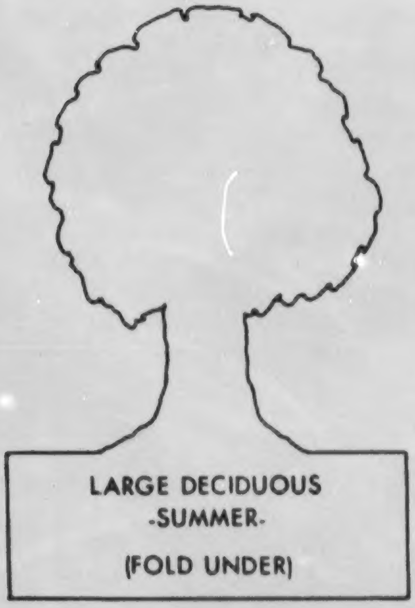
WORKSHEET C

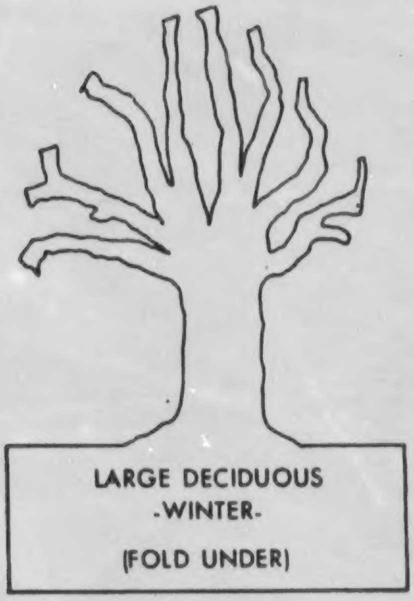

SHRUB
(FOLD UNDER)


SMALL DECIDUOUS
SUMMER
(FOLD UNDER)


SMALL DECIDUOUS
WINTER
(FOLD UNDER)


EVERGREEN
(FOLD UNDER)


LARGE DECIDUOUS
-SUMMER-
(FOLD UNDER)


LARGE DECIDUOUS
-WINTER-
(FOLD UNDER)

Teacher Information Sheet

A PASSIVE SOLAR ENERGY HOUSE

Suggested Grade Level and Discipline

7-12 Science
Home Economics
Consumer Education
Industrial Arts
Agriculture Education

Background Information

Passive use of solar energy involves using the sun's energy to heat a structure or substance without the need for any other energy source to accomplish energy transfer. The antithesis of this is the active use of solar energy which usually involves pumps and/or fans powered by electricity to accomplish the energy transfer.

There are various designs for passive solar systems, many of which were created by individuals for their own unique situation. Passive solar energy use involves many simple ideas that a homeowner can incorporate into a new home or an existing home.

The underlying principles involved in using passive solar energy for heating combine various structural patterns with landscaping to have the maximum use of the sun during the cold weather and minimum use of the sun during warm weather. To accomplish these ends, an overall site plan for a building lot must be devised based on some elementary knowledge of the sun's position at various times during the year. Most of the information about the motions and positions of the sun is available for a given locality from weather bureau publications. However, specific features on or near a building lot must be studied to account for their effect on the sun's availability at various times of a day or year. Hills, large trees, and other structures are some of the factors that can directly affect the availability of sunlight for a given locale. It is best, if a new building is to be built, to collect information about the sun's availability before deciding on the orientation of the building.

For a new building, certain structural design features will make passive solar heating attainable. Windows should be maximized on the south and west sides of the building and minimized on other sides. The windows should be at least double glazed on the south and west sides and tripled glazed on the other sides. An overhang should be built on the south and west windows which cuts out the sun during the summer and early fall and allows the sun to penetrate during late fall, winter and early spring. The windows on the sun side of the house should be covered at night with insulating drapes or by other means to keep the warm house air from contacting the cooler windows. The house should be properly insulated and weatherstripped to avoid infiltration and conduction heat losses as much as possible.

The landscaping of a building can contribute to best use of the sun's energy. Deciduous trees should be located on the south and west side of the building. Their leaves will shade the house in the summer and when their leaves fall will allow the sun to strike the building during fall and winter.

Coniferous trees should be located on the wind side of the building. They provide very good wind breaks for the prevailing winds in an area. Wind usually increases infiltration heat losses from a building. Reducing the wind should cut these losses.

This activity encourages the students to be creative in designing a passive solar home. Many other passive solar designs are available. Students might investigate them by reading the literature and incorporating a more complex system into their designs.

Hints on Gathering Material

- Scissors, tape, pencils and straight edges should be available for all students. (Toothpicks, see Suggested Approach)
- Worksheets A, B and C can be reproduced by various copying machines on heavyweight paper or traced onto a ditto master.

Suggested Time Allotment

- Two class periods.

Suggested Approach

- Have the students work individually and compare results after completing their designs.
- Leaving some of the work on display will encourage further discussion and investigation.
- An alternative would be to assign the activity for homework and follow up with a full period of display and discussion directed by the teacher.
- Tape toothpicks to backs of trees for added strength.

Typical Results

- The objectives are simple and will be achieved by virtually all students.
- Construction of the dwelling and various landscapes will vary a great deal in artistic quality and should not receive a great deal of emphasis as these aspects are not directly related to the objectives.

Precautions

- *Scissors will seldom fail to return to the equipment storage if they are attached with a cord to 6cm wooden blocks.*

Modifications

- Modify the activity for students with greater sophistication by encouraging precise measurement of sun angle, roof pitch, overhang length, etc.

- Encourage the artistic student to design interior room spaces based on the best energy utilization.

Evaluation

- Evaluate each design by inspection and discussion with the students.

- Points to look for when evaluating students' work:

  a. Most windows should face south and have a roof overhang for summer use.

  b. Deciduous trees should be planted or oriented to the south and west sides of the house.

  c. Evergreens should protect the house from the prevailing winds in a given locality.

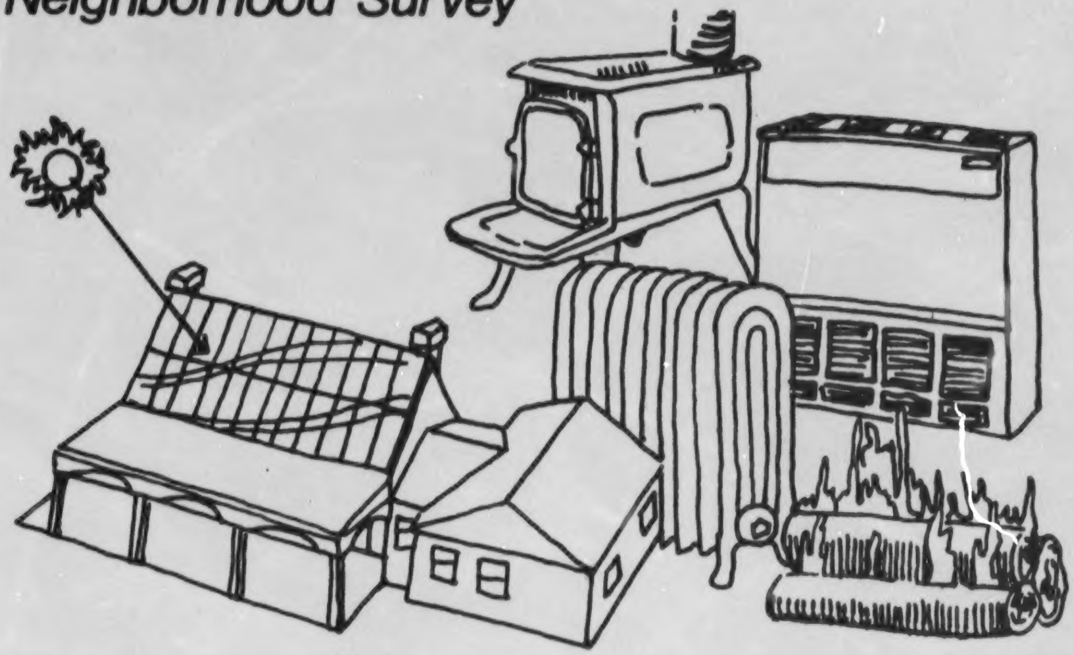
References

- *Energy Book #1*, John Prenis, editor, (Running Press, Philadelphia, Penn.), 1975, pp. 112.

- *Passive Solar: A Controlled Experiment in Home Heating*, Arthur Fisher, (Popular Science), April, 1978, pp. 76-79.

- *Solar Energy, The Ultimate Powerhouse*, John L. Wilhelm (National Geographic) March, 1976, pp. 392-393.

Neighborhood Survey



Instructions:

In this activity, the students go into their neighborhoods and survey the types of energy their neighbors use in their homes. (See attached student form.)

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Neighborhood Survey

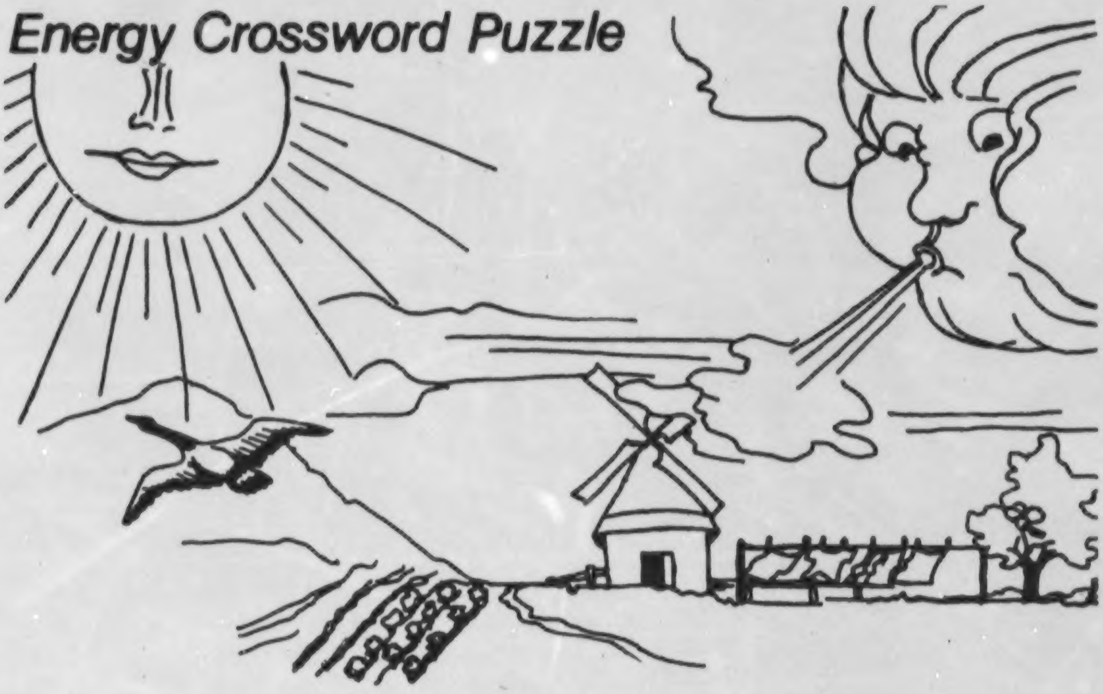
TEACHER ________________ SCHOOL ________________ STUDENT ____________

ASK YOUR NEIGHBORS WHICH TYPE OF ENERGY THEY USE FOR HEATING WATER, HEATING THE HOME, AND COOKING THE FOOD WITHIN THE HOME. PUT A CHECK FOR EACH KIND OF ENERGY THEY USE.

REMEMBER TO BE POLITE! TELL THEM (1) WHO YOUR ARE, (2) WHAT YOU ARE DOING, AND (3) WHY YOU WOULD LIKE THE INFORMATION. REMEMBER TO SAY "THANK YOU" WHEN YOU ARE READY TO LEAVE.

NEIGHBOR'S NAME	SOLAR	WOOD	NATURAL GAS	ELECTRICITY	OTHER

Energy Crossword Puzzle



Instructions:

This crossword puzzle is used to emphasize energy terms.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Energy Crossword Puzzle

ACROSS

1. CREATED BY THE NATURAL HEAT OF THE EARTH

5. A FOSSIL FUEL FORMED FROM THE REMAINS OF VEGETATION.

7. IT GIVES THE BODY ENERGY.

8. IT IS VERY IMPORTANT TO THE MAKING OF NUCLEAR ENERGY.

10. A PLACE TO GET COAL.

11. THE TYPE OF ENERGY WE GET FROM THE SUN.

12. THE BASIC FOOD OF ALL ANIMAL LIFE.

13. THE WIND HELPS THE AIRPLANE ____________.

15. THE AIR GOING FROM ONE PLACE TO ANOTHER.

DOWN

1. IT IS EXTRACTED OR REMOVED FROM THE GROUND BY DRILLING WELLS.

2. IT IS CALLED A FOSSIL FUEL BECAUSE IT WAS FORMED MILLIONS OF YEARS AGO.

3. IT IS THE CAUSE OF ALL MOTION AND CHANGE.

4. THIS FORM OF ENERGY TURNS A TURBINE.

6. IT IS THE SOURCE OF ALL ENERGY USED BY LIVING THINGS.

7. ANOTHER NAME FOR COAL, OIL, AND NATURAL GAS. (2 WORDS)

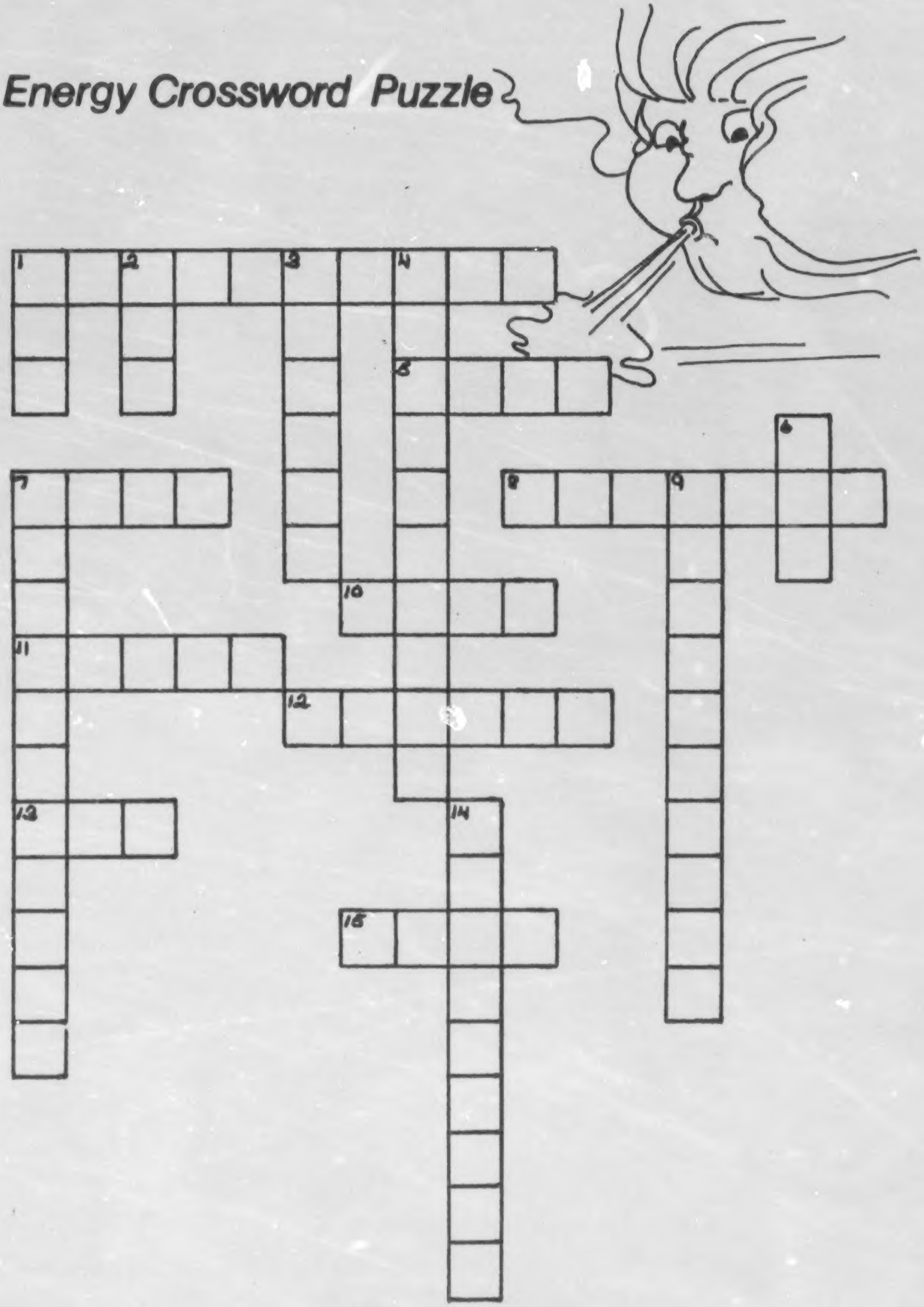
cont.

9. A FOSSIL FUEL THAT IS NOT A LIQUID OR A SOLID. (2 WORDS)

14. A DEVICE USED TO CREATE ELECTRICITY.

COAL
ENERGY
FLY
FOOD
FOSSIL FUELS
GAS
GENERATOR
GEOTHERMAL
MECHANICAL
MINE
NATURAL GAS
OIL
PLANTS
SOLAR
SUN
URANIUM
WIND

Energy Crossword Puzzle

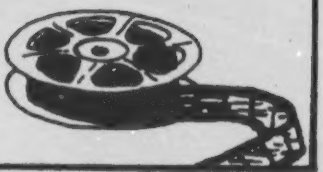

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

PRESENTS

Our Mister Sun

No. 7123

59 min.



Instructions:

This film will help the students:

1. Obtain information on how the sun effects life on earth and its size, weight, heat, energy, and radiation.
2. Become more familiar with the equipment and vocabulary used in research of the sun.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

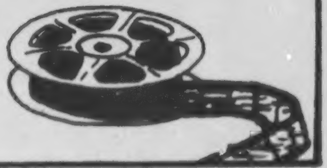
EAC

PRESENTS
LEARNING ABOUT SOLAR ENERGY

No. 1730

10 min.

16 mm.



INSTRUCTIONS:

THIS FILM WILL HELP THE STUDENTS:

1. RECOGNIZE ENERGY.
2. OBTAIN INFORMATION ON THE SOURCES OF ENERGY.
3. BECOME AWARE OF THE FORMS OF ENERGY AND HOW THEY ARE CONVERTED.
4. SEE HOW OTHERS USE ENERGY.

NOTES:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

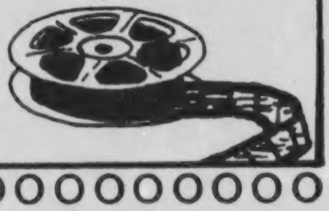
4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

EAC

PRESENTS

THE SOLAR GENERATION



22 min. No. 1727

INSTRUCTIONS:

THIS FILM WILL HELP THE STUDENTS:

1. UNDERSTAND THAT SOLAR ENERGY IS A PROVEN ALTERNATIVE SOURCE WORTH DEVELOPING.
2. SEE HOW SOLAR ENERGY IS BEING USED IN HOMES, SCHOOLS, AND INDUSTRY.
3. REALIZE THE OBSTACLES TO THE USE OF SOLAR ENERGY.
4. PROJECT THE POSSIBILITIES OF SOLAR ENERGY IN THE FUTURE.

NOTES:

Which of the following questions could be answered with this activity?

1. What is energy doing?

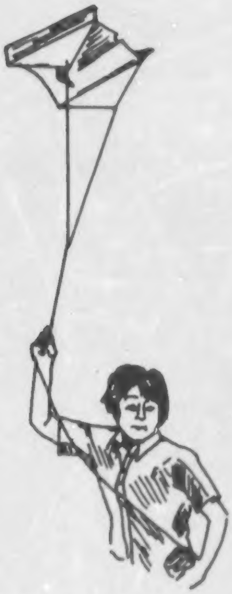
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

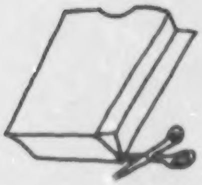
5. How could this activity change the individual's use of energy?

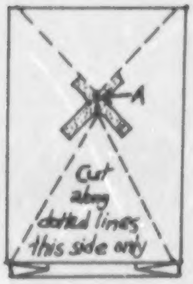
Kites



Instructions:

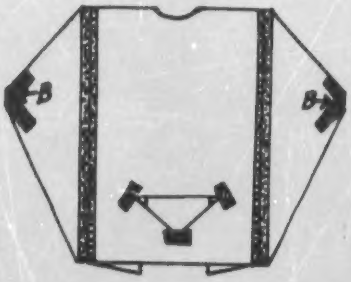
1. Take any size of brown paper bag and cut off the bottom.

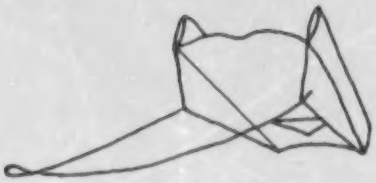



A
Cut along dotted lines this side only

2. On the side with a seam, find the center of the top and mark point "A" 1/3 of the way down. Make an "X" with cellophane tape over point "A". Mark corners of bag 1/4 inch from outside; then draw lines from these marks to point "A". Cut along line to form wings.

3. Turn bag over, spread wings, and tape wings to body (see diagram). In lower portion of bag cut out a triangular vent and put tape around corners for reinforcement. On wings where tape crosses punch in holes "B".





4. Connect each end of a 6' length of string to holes "B". Make a loop in the center of the string and attach the flying string.

5. Kites help one become aware of how much wind we have. Does it take lots of wind to fly a kite? Can there be too much wind? How much wind is usually blowing? Try to find other ways of making kites.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

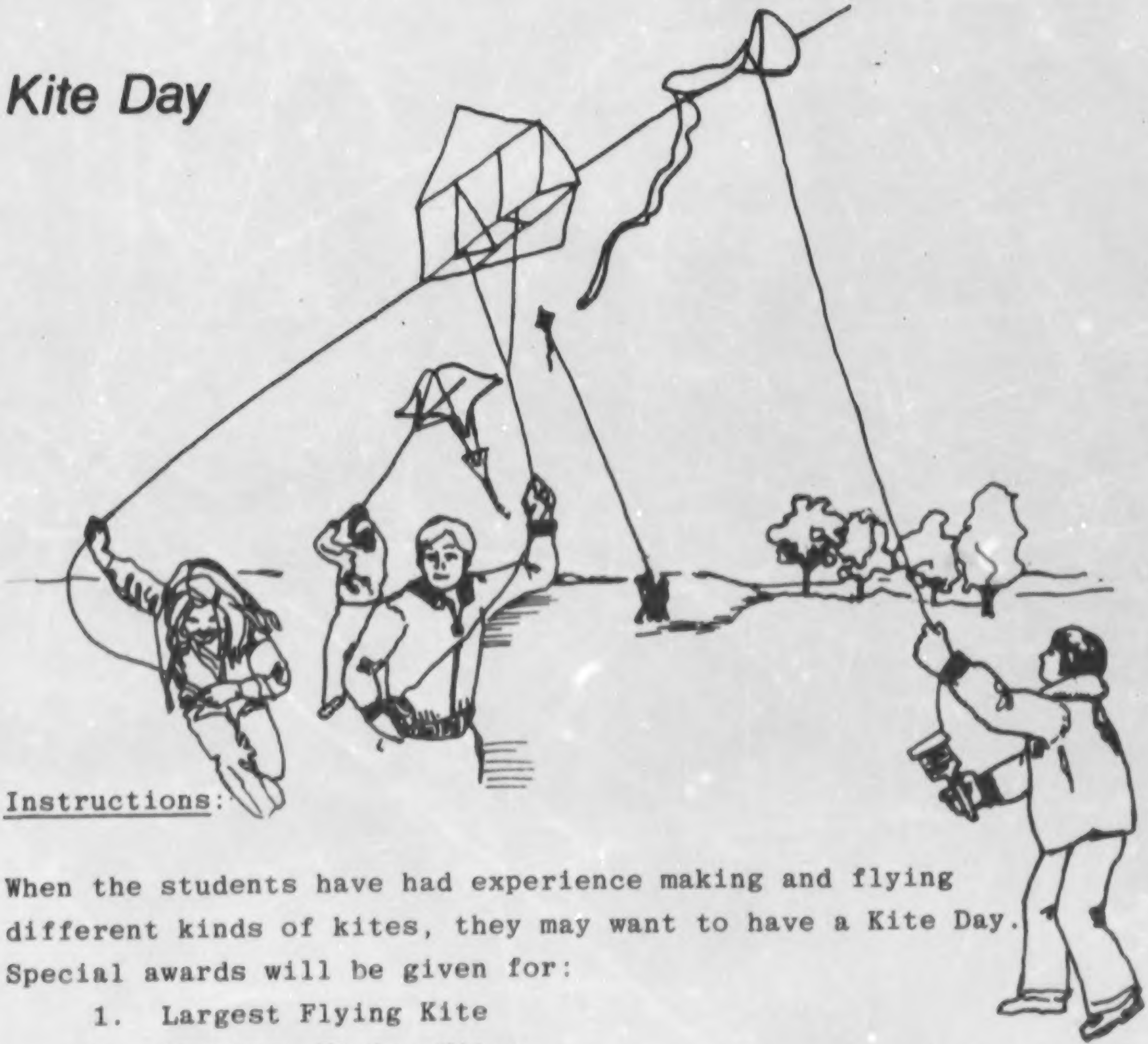
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Kite Day



Instructions:

When the students have had experience making and flying different kinds of kites, they may want to have a Kite Day. Special awards will be given for:

1. Largest Flying Kite
2. Smallest Flying Kite
3. Most Creative Flying Kite
4. First Kite Up and Flying (Individual)
5. First Kites Up and Flying (Team)
6. Participation
7. Judges' Special Award

Which of the following questions could be answered with this activity?

1. What is energy doing?

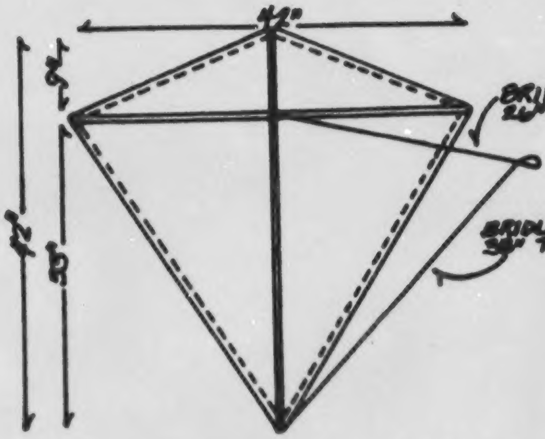
2. What forms are being converted?

3. What resources are being used?

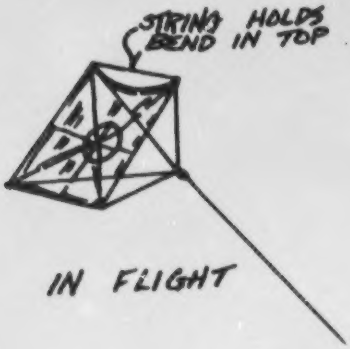
4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

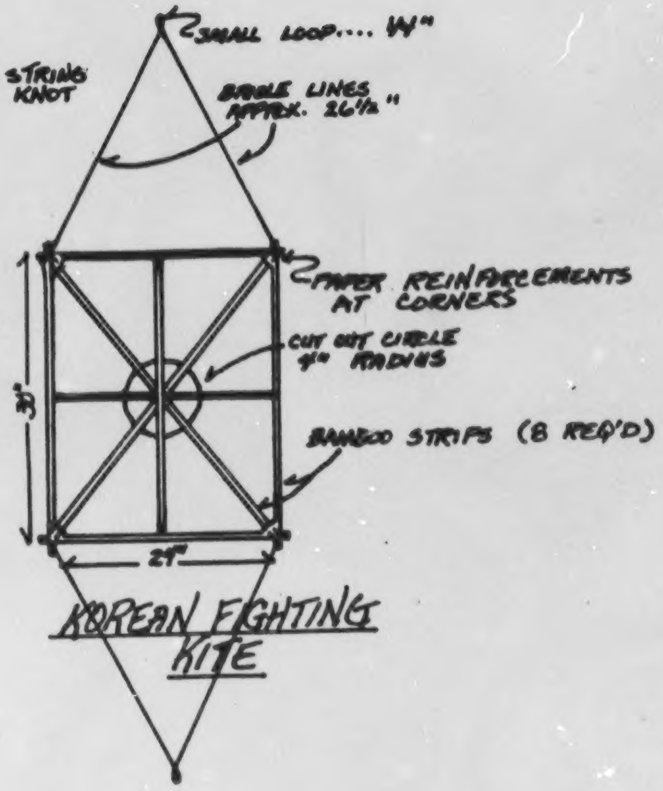
Kite Day


42"
8"
42"
34"
BRIDLE STRING 24" TO KNOT
BRIDLE STRING 34" TO KNOT

BOWED, MALAY OR EDDY KITE

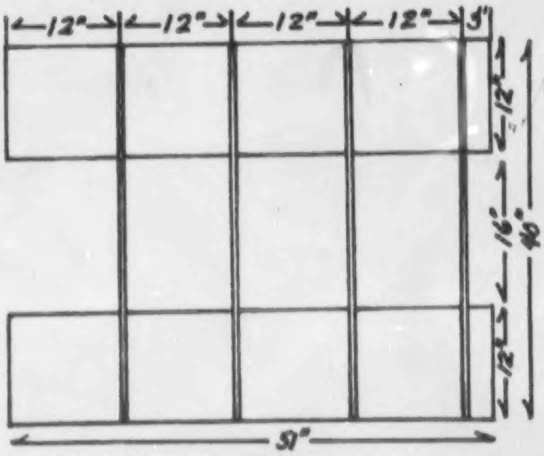

STRING HOLDS BEND IN TOP

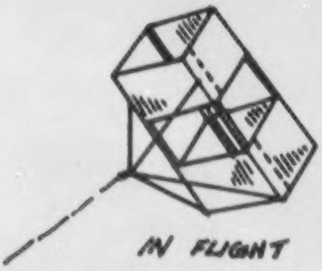
IN FLIGHT


SMALL LOOP.... 1/4"
BRIDLE LINES APPROX. 26½"
PAPER REINFORCEMENTS AT CORNERS
CUT OUT CIRCLE 4" RADIUS
BAMBOO STRIPS (8 REQ'D)
30"
24"

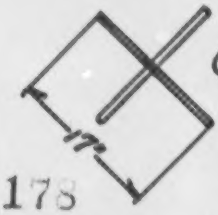
KOREAN FIGHTING KITE

BASIC BOX KITE


12"
12"
12"
12"
3"
12"
16"
40"
12"
51"



IN FLIGHT



X-BRACE STIFFENERS (2 REQ'D) NOTCHED AT ENDS

Energy Adventure Center

KITE DAY

This is to certify that

____

participated in

____

____
teacher

____
school

EAC

____
EAC facilitator

____
date

Energy Adventure Center

KITE DAY

This is to certify that

took first place for

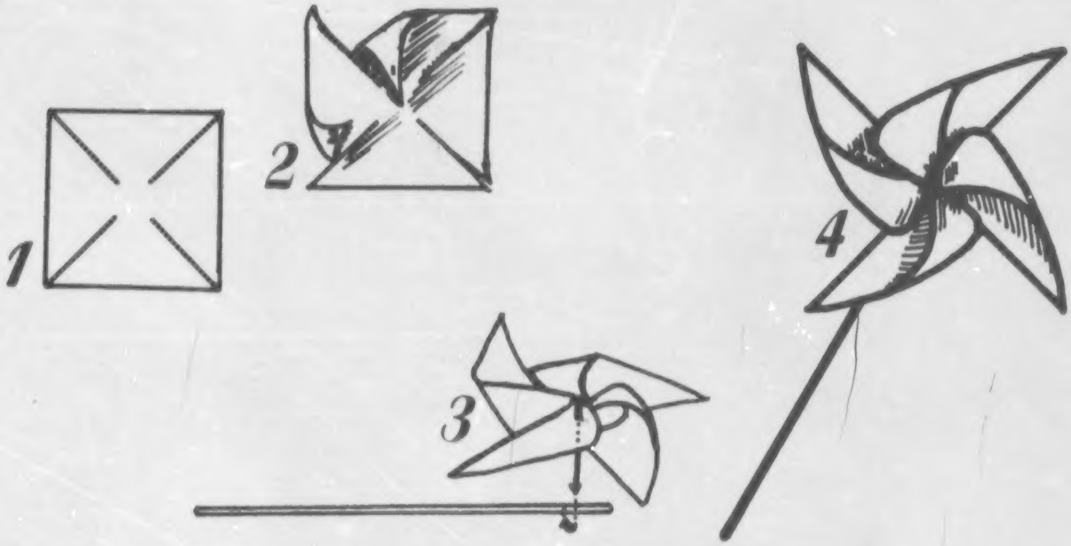
teacher

school

EAC facilitator

date

Pinwheel



Insrtuctions:

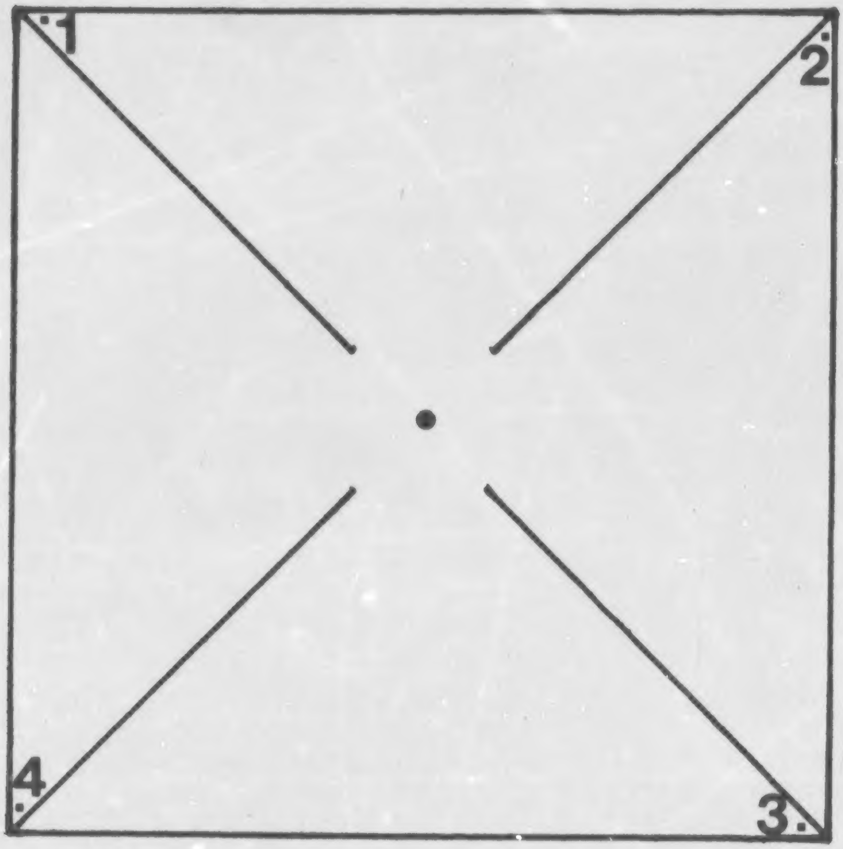
Cut the pattern along the lines. Without creasing or folding the paper, bring points 1,2,3, and 4 together at the center. Stick a pin through these points respectively, then stick the pin through a straw and bend the pin with pliers to secure it to the straw.

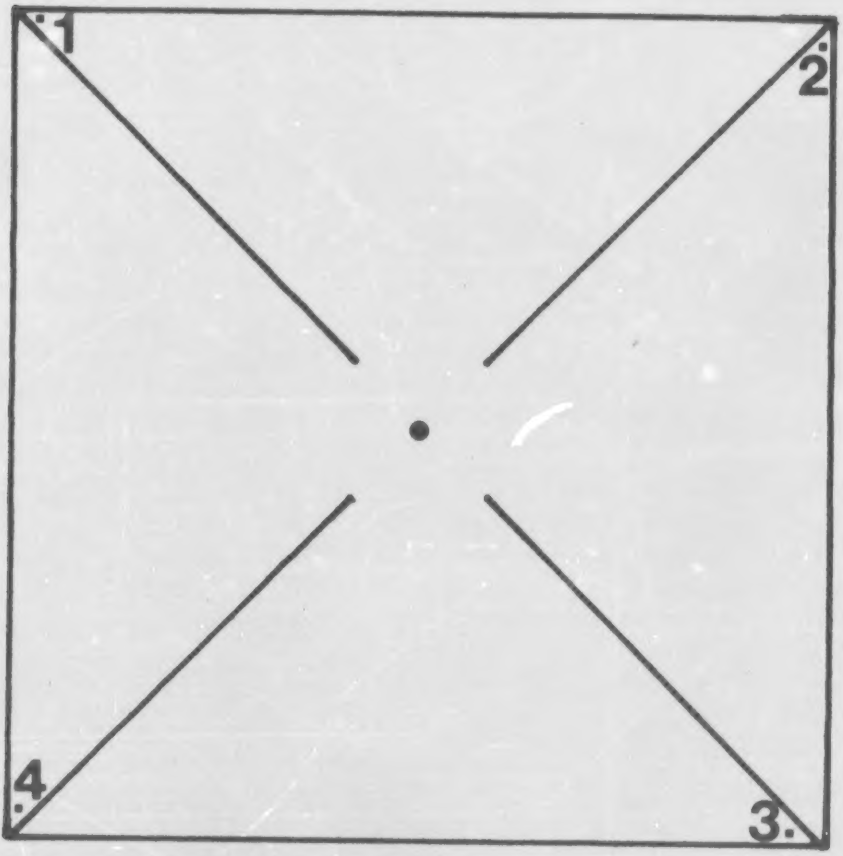
Notes:

Which of the following questions could be answered with this activity?

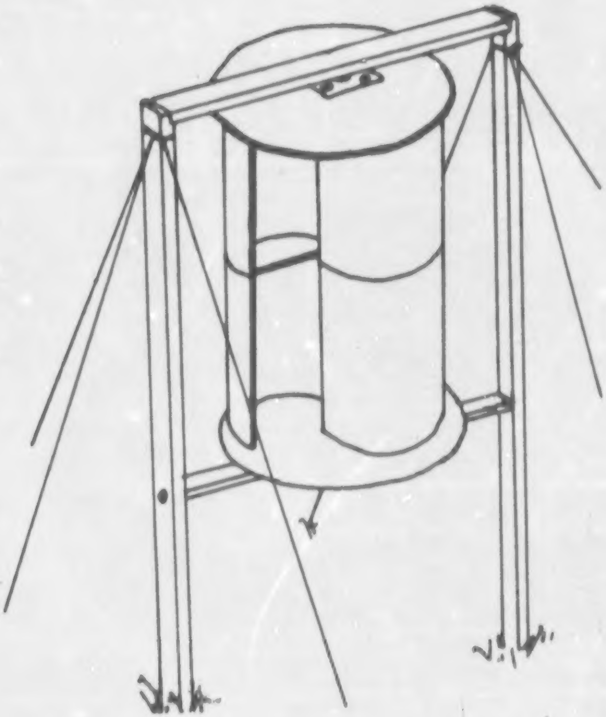
1. What is energy doing?
2. What forms are being converted?
3. What resources are being used?
4. What changes could this activity mean for society?
5. How could this activity change the individual's use of energy?

Pinwheel





Savonius Rotor



Savonius rotors are a low-speed, high-torque wind turbine. They are not the most efficient wind turbines, but they are very easy to make. Students can become aware of how much wind is necessary to run a savonius rotor and how often we have this much wind.

Materials:

1. Rigid cardboard tube - Toilet tissue core, paper towel core, or IBM type copier paper core are excellent choices.
2. Cardboard material for end circles - The weight of the material may vary from a cardboard box to index cards depending on the weight of the core.
3. Axle rod several inches longer than the tube - Again, the material may vary from a soda straw or wire to a wooden dowel rod depending on the weight of the core.

Equipment:

1. Drawing compass

Instructions:

1. Measure the diameter of the tube. Multiply this

Savonius Rotor

number by 1½. Cut two end circles using this number as the diameter.

2. Punch a hole in the center of each end circle the same size as your axle rod.
3. Draw a line across the diameter of the circle.
4. Cut the tube lengthwise into equal halves.
5. Glue one half of the tube to one end circle as shown in Fig. 1.
6. Glue the other half of the tube to the same end circle forming an "S" as viewed from the top of Fig. 2.
7. Glue the other end circle to the top (Fig. 3). Set aside to dry.
8. Put the axle through the centers of the end circles (Fig. 4).

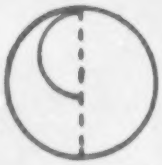


Fig. 1

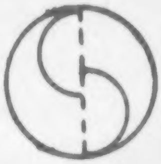


Fig. 2

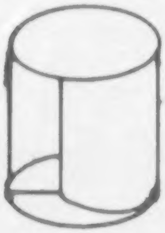


Fig. 3

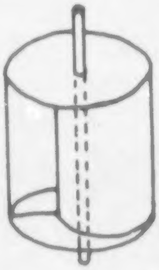


Fig. 4

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Solar and Wind

Objectives: Students will become aware of which form of energy comes from the sun.

Students will identify the conversion of radiant energy to thermal energy and be able to describe why it occurs.

Students will be able to recognize the applications of this conversion.

Students will be able to name the three basic parts of a solar collector and tell the function of each.

Students will be able to describe the difference between active and passive solar systems.

Students will recognize that the earth is itself a solar collector and describe why.

Students will become aware of what causes the seasons.

Students will become aware of what causes the wind.

Students will become aware of what things the mechanical energy in the wind can do.

Materials Needed: Solar panel outside of A-1, solar hot water tank, globe, solar window furnace, wind box, cutaways of solar panels and window furnace, various wind machines in A-1, and a map of the United States.

I. Review the seven forms of energy

   A. Mechanical
   B. Radiant
   C. Chemical
   D. Electrical
   E. Nuclear
   F. Thermal
   G. Sound

II. Energy from the sun

   A. Of the seven forms, which come from the sun? (Be prepared for many responses, but the two most likely ones are:)

      1. Thermal
      2. Radiant

   B. Let's examine these responses.

      1. The earth, sun, and other planets form the solar system.

      2. Any energy that reaches the planets from the sun has to travel through space.

        a. What is the temperature in space? (Very cold)

        b. If thermal energy were coming from the sun, what should the temperature be? (Very hot)

        c. Therefore, we do not get thermal energy directly from the sun. (Be prepared for some disagreement.)

    3. What season of the year are we the closest to the sun? (Winter) The farthest? (Summer)

        a. If a camper moves closer to a campfire does he get warmer or colder? (Warmer)

        b. Why doesn't the earth get warmer in winter when it moves closer to the sun? (Because we don't get thermal energy directly from the sun)

        c. We only get radiant energy directly from the sun.

III. Energy on earth

    A. If our thermal energy doesn't come directly from the sun, where do we get it? To answer that question, we need to take a look at what makes up the earth's surface and the definition of energy.

        1. All substances, including the earth's surface, are made up of tiny particles called molecules.

        2. What does energy make things do? (Move or change)

        3. The dark colors of the earth absorb the radiant energy from the sun. This makes the molecules move more rapidly. When they do, they rub against each other. This produces heat; just like rubbing your hands together.

IV. The tilt of the earth [Use the globe to demonstrate]

    A. In the summer, the northern hemisphere is tilted toward the sun. even though the earth is farther away from the sun, this tilt causes the sun's rays to strike us directly. They are, therefore, more concentrated.

    B. In the winter, the exact opposite occurs. The northern hemisphere is tilted away from the sun. The sun's rays strike the surface at a wide angle. This decreases their concentration. Since less radiant energy is absorbed, less is converted into thermal energy. The winter months are colder.

    C. One other factor is important to consider. The tilt of the earth causes a variance in the length of day and night throughout the year. In the summer, we have long days and short nights. This allows more time for the surface to absorb energy and less time to lose it. In the winter, short days and long nights reverse this process.

V. Solar collectors

    A. Could we imitate this process and use the energy for ourselves? (Yes)

    B. What would we need to do this? (A converter)

C. [Show cutaway of water solar panel] This is a converter that will do just that. A solar panel. You can see that it has three basic parts. All solar collectors are alike in this respect.

  1. A clear surface. This surface allows the radiant energy to enter the collector. It also helps to retain any energy that may try to "bounce" back.
  2. A dark surface. This surface absorbs the radiant energy and converts it into thermal energy.
  3. A layer of insulation. This helps to retain the heat.

VI. Active solar systems

A. You will notice that this collector has pipes or tubes connected to the black surface. These are for water. The water absorbs the heat and carries it into the house where it can be used for various purposes. On a sunny day, this water will be as hot or hotter than hot water from most home hot water heating systems. [Have students feel the water circulating through the collector outside A-1] This is not the water you would use in your house. It is only the "working" water.

B. [Show hot water tank] This "working" water circulates through the silver grid around the tank. The heat is transferred to the water inside. The water inside is what you use. If there is not enough sun, an electric element is used for backup.

C. If you want to use the sun for space heating you would choose a different collector. [Show air to air cutaway] This has a larger space instead of pipes. Air is blown through it and then into the house.

D. In each of these examples, a pump, a fan or some other kind of device must be used to move a "working fluid." Whenever something must be done to the system to make it function, it is called an active system. You must perform some kind of action or activity.

VII. Passive solar systems

A. [Show cutaway of solar window furnace]

  1. Is this a solar collector? (Some will say yes, others no. They may not recognize the styrofoam as insulation.)
  2. How can you tell? (It has the three basic parts.)

B. This is a passive solar window furnace. [Show large model] It's called passive because it works all by itself. You don't have to do anything to it. It even turns itself on and off.

  1. It hangs in a south facing window.
  2. In the morning, the sun begins to shine on it. The radiant energy is absorbed by the dark surface and is converted into thermal energy. The air above this surface becomes hot.

3. What does hot air do? (Rises) The air then moves upward and out into the room. This pushes the cooler air in the room back around toward the window furnace. The cooler air enters the bottom opening.

4. What does cold air do? (Sinks) The air sinks to the bottom of the window furnace where it now contacts the warm, dark surface.

5. What happens to it then? (It gets warm and rises.) This circulation continues as long as the sun shines on the collector.

6. What happens when the sun goes down? (The circulation stops because the collector is no longer warming the air.)

VIII. The earth as a solar collector

A. You've seen several examples of solar collectors.

1. Does a solar collector have to be any special shape? (No)

2. What does it have to have? (A clear surface, a dark surface, and insulation)

3. Is a car a solar collector? (Yes)

4. Is a house a solar collector? (Yes)

5. What is the biggest solar collector that you can imagine? (There will be many answers, but guide them toward the earth.)

B. Earth

1. How do you know that the earth is a solar collector? (It has the three basic parts.)

   a. What is the clear surface? (Atmosphere)
   b. What is the dark surface? (The water, the land, and the vegetation)
   c. What is the insulation? (The various layers under the surface)

2. Do all parts of the earth collect the same amount of energy? (No)

   a. Which part collects the most? (Equator)
   b. Which part collects the least? (Poles)

3. This means that the air above the equator is warm and rising while the air above the poles is cold and sinking. The warm and cold air moves around the earth just like the circulation in the passive solar window furnace. [Demonstrate this to the students using the wind box.]

4. What do we call this moving air? (Wind)

IX. Wind

A. What can the wind do for us? (Turn wind mills) [Show the students the various wind machines in A-1.]

B. In fact, you would not even be here if it weren't for the wind. The early settlers came to this country by sailing ships. These ships were moved by the wind.

C. Not only that, we could not survive if it weren't for the wind. Why? (Lots of answers will be given.)

   1. What is the main product of Kansas? (Wheat)
   2. What do you need to grow wheat? (Sun, ground, and water)
   3. [Show students U.S. map.] Look at Kansas. How much water do you see? (Very little)
   4. Where do we get the water for our crops? (Rain)

D. As the warm air (wind) moves northward it evaporates large quantities of water from the Gulf of Mexico. This moisture is carried up across the central U.S. When it meets the cold air moving southward, the moisture condenses and falls as rain. If this mixing occurs over Kansas, we get the rain.

E. So the wind causes the weather--without which we could not survive.

X. Review

A. What form of energy comes to us directly from the sun? (Radiant)

B. Where do we get the thermal energy? (From the conversion of radiant energy by the earth)

C. When are we closest to the sun? (Winter)

D. What causes the seasons? (The tilt of the earth)

E. What are the three parts of a solar collector? (A clear surface, a dark surface, and insulation)

F. What is an active solar system? (One that has pumps or fans to move the heat around)

G. What is a passive solar system? (One that works by itself without doing anything to it)

H. How do you know that the earth is a solar collector? (It has a clear surface, a dark surface, and insulation.)

I. What causes the wind? (The sun warming the earth unevenly causing the air to move)

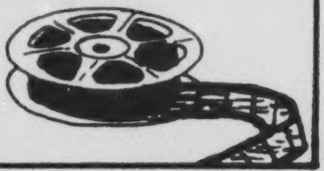
J. What can the wind do for us? (Turn windmills, power ships, cause weather, etc.)

PRESENTS

Energy: The Problems and the Future

No. 1726

23 min.



Instructions:

This film will help the students:

1. Become more aware of energy alternatives for the future, such as hot water wells, tidal, ocean thermal energy conversion, windmills, biomass conversion, etc.
2. Become aware of areas in the United States where research is being done on these alternative sources of energy for the future.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

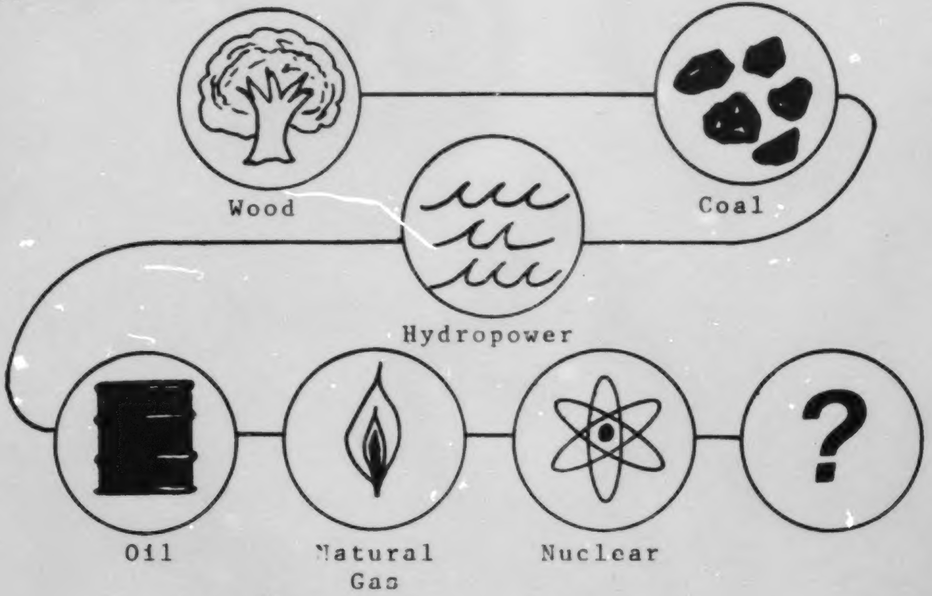
3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Society and Energy

Energy Use Eras



Instructions:

Changes in the types of energy resources consumed have taken place because of:

1. shifts in price advantages
2. technological developments such as the automobile and the electric motor
3. consumer preference.

1850	Wood provided 90% of the energy consumed because it was abundant and inexpensive.
1850 - 1885	The introduction of the Bessemer process of making steel in the late 1860's gave impetus to the coal industry. By 1885, the use of wood as an energy source had declined to 47.5% and coal climbed to slightly over 50%. Oil and natural gas were relatively recent entrants to the energy marketplace. Oil provided 0.7% of the energy and natural gas provided 1.5%.
1910 -	Coal contributed over 75% of the energy consumed because of the demands made on energy by industry and the railroads. Wood continued to decline. Oil and natural gas (combined) provided 9.3% of the energy. Hydropower, which entered the energy

marketplace as a new source of power in 1890, provided 3.3% of the energy mix.

1950 - Because of their convenience and efficiency, oil and natural gas continued to provide more of the energy consumed. Oil provided 36.2% of the energy and natural gas provided 19.2%. Coal's share fell to 36.8% and wood to 3.3%. Hydropower had increased to 4.6%.

1950 - 1978 Oil and natural gas increased their combined share of the energy mix to 74%. Coal declined to 18.1% (but was 43.6% of the primary energy source for electrical generation). Hydropower declined to 4.0%. Nuclear energy, which entered the energy market in 1961, increased its share to 4.1%. Wood declined to 1.0% of the energy market.

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Energy Timeline

From their earliest history, human beings have sought to minimize their labor through the use of tools. Early hunters used tools to kill animals, and thereby stretched their own biological energy, derived from sunlight in the form of food, to get more energy from the bison and mammoth.

The most vital discovery during the stone age was how to make fire.

During the later Neolithic period, humans used stone tools for agriculture, and were able to produce renewable crops. The first stable communities began to develop, and various forms of housing were built. These primitive dwellings were all designed to meet the climatic needs of the area in which they were located. Thus communities could flourish, since the population did not have to migrate with the seasons to escape unfavorable weather conditions.

Further technological progress brought the ability to mine metals and use fire to forge them into tools and weapons. First came copper, then bronze, which is a mixture of copper and tin. Following the Copper and Bronze Ages came the Iron Age, which may have begun in Africa or the Orient about 2,400 years ago.

Before the time of the Greek and Roman civilization, the only significant energy sources were natural ones. The power of falling water was used in basic industry, agriculture, and grinding grain. The power of the wind was used for ships, and fire from the burning of wood was the major energy source for industry. Much of the mining and mechanization in early cultures--and certainly in Greece and Rome--was for the purpose of improving weapons for war.

The major source of energy in both Greece and Rome was the energy of human bodies--particularly slaves. From the Greek and Roman era to the beginning of the Industrial Revolution, sophisticated tools were developed, but they were powered by humans or animals. Yet the idea of a heat engine--a device that would use heat to do work--had been envisioned as early as 75 A.D. by the Greek inventor Hero. He made a toy which would spin as steam was expelled through vents.

Toolmaking and architecture were the primary developments between the fall of the Roman Empire and the last few years of the 17th century. Many significant inventions were developed during this time. This was the time of Leonardo da Vinci, but the application of his mechanical discoveries was limited by the absence of energy sources. Technical advances during this time included the printing press and the mechanical clock.

These years in European history were an era of great intellectual and scientific advancement. This was the dawn of Galileo's physics, Kepler's astronomy, and the mathematics and philosophy of Spinoza, Descartes, and Newton. Some of the great laws of nature were conceived. The spirit of the era was discovery--of the world and of applied science.

But to bring about the era of modern technology, an engine was necessary that could use an energy source and produce useful work. The water mills and windmills were limited to specific sites and there was no way known to transport their energy to where it was needed. By the end of the 17th century, this engine appeared. In 1698, Englishman Thomas Savery obtained a patent for a machine which used fire to boil water generating steam in a boiler for use in draining water from mines. His steam engine pump was soon improved upon, and these engines made possible the deep mining of coal, which had previously been hampered because of the buildup of underground water in the mines.

Englishman James Watt patented a vastly improved engine in 1782, and by this time the steam engine had become the forerunner of mechanized civilization. They were used for pumping water and supplying power to textile mills, rolling mills, and flour mills. A later breakthrough came with the development of engines that could use high pressure steam, making the engines much more efficient. With Robert Fulton's successful operation of the steamboat Clermont on the Hudson River in I807, and Richard Trevithick's use of a steam locomotive to transport coal in Wales, the modern era of mechanized transportation began.

Little was actually understood about the theory of these engines, until the use of the science of thermodynamics. When these scientific principles came to be understood, bigger and better engines could be built.

Up until the second half of the 19th century, the United States' energy sources were primarily muscle power of humans and animals, along with wind, wood, and falling water. Ninety percent of the fuel burned in 1850 was wood. Coal accounted for only 10 percent, despite the presence of plenty of coal and the technology to use it. The extensive cutting of forests in the east raised the price of wood and increased the distance that it had to be transported to the growing cities. So the demand for coal skyrocketed until in 1885 coal surpassed wood as the dominant fuel. In 1885, coal was used to fuel the railroads, to make coke for the steel industry, to power miscellaneous industries, and to provide residential fuel. Coal was to remain the dominant fuel well into the 20th century.

During the 1800's pressure increased for better and cheaper lighting methods. The various oils burned to produce light were expensive, explosive, or otherwise unsatisfactory. England had developed a coal gas pipeline network for lighting, but the scattered population and undeveloped coal industry in the United States made such a network generally impractical. Finally, an Englishman devised a method of producing oil from coal, which he called coal oil or kerosine. By the late 1850's, there were many kerosine plants in the Eastern U.S. Then some people began to notice a resemblance between the kerosine and the largely useless "rock oil" that came out of springs and wells in western Pennsylvania. In 1857, a Yale chemistry professor, hired by a group of Pennsylvania entrepreneurs called the Pennsylvania Rock Oil Company, gave his report on some of this oil. He concluded that some "very valuable products" might be manufactured from it. Drilling, rather than digging, turned out to be the best way of getting to the oil, and so in September 1859, in Titusville, Pennsylvania, oil was struck at a depth of 69 feet. This was not the first oil well in history--

the potential value of oil had been recognized centuries before. But it was only in the Western industrial world of the time that science, technology, and society all came together at a point necessary for oil to be exploited as the concentrated fuel that would eventually replace coal.

The crude oil was made mostly into kerosine. Some of the other products were lubricants, necessary for increasing mechanization; and fuel oil, whose use grew as it began to replace coal for firing boilers for steam generation.

The use of steam for railroads and ships was a great step for transportation, but coal was too bulky and inefficient for use in any smaller scale vehicles. What was needed was a smaller engine. In 1870, inventors began testing an engine using gasoline in a compressed air-gas mixture. Up until this time, gasoline had been a generally useless by-product of kerosine refining. In 1887, a gasoline-fueled engine was adapted to vehicles and the first Benz automobile was patented. This engine was the forerunner of all internal combustion engines in operation today. By 1900, many automobiles had been built in the United States, most of them steam-driven or electrically powered. But the increasing availability of both fuel and lubricants for gasoline-powered automobiles speeded their development. They were light, maneuverable, fast, and competitive in cost. In 1900, the Oldsmobile switched from steam to gasoline, and three years later, Henry Ford introduced his gasoline-powered automobile. His mass-production techniques revolutionized industry.

A milestone in energy history occurred in 1879, with Thomas A. Edison's electric light. Edison himself, however, saw his own greatest achievement not as the light itself, but as the world's first electrical power-generating and distribution system. In 1882, he supervised the building of this system to light 1200 lamps in a one-half square mile area in New York City. Edison's generating station consisted of four boilers which produced steam to power six generators.

Electricity made it possible to deliver energy to distant sites cheaply and cleanly. It essentially put the steam engine at the disposal of every home, business, and industry in America and much of the Western world.

Shortly after Edison's station began to generate electricity, water wheels began generating the nation's first hydroelectric power in Appleton, Wisconsin.

As electricity became more widely available, the number of electrical devices grew dramatically. Work that was previously done by muscle power could now be done by the new "labor-saving devices," and mechanization of the home was underway.

The latter half of the 19th century also saw a series of inventions which led to farm mechanization. These inventions included the reaper, the

the harvester, and the twine binder. Such inventions were necessary to develop the agricultural base to support the high-energy society that was rapidly evolving.

Energy use in the United States grew dramatically in the first decades of the 20th century. The number of automobiles increased at a remarkable pace--from 8,000 in 1900, to 194,000 in 1908, to more than 8 million in 1920. Electrical power generation increased at an amazing pace--by 1917 electric consumption was more than seven times what it had been in 1900. Factories had found electric power especially suited to the concept of the assembly line, and the number of electric motors soared. Electricity thus made practical the mass production of appliances, which were themselves electrically powered.

Total energy use in the United States grew much more slowly after World War I, and the shift toward oil continued. Oil overtook coal as the dominant fuel just after World War II, and has continued to claim an increasing share of the market. This shift to oil was brought about by the growing use of the automobile, and the switch from coal to fuel oil for residential heating and powering trains. Gasoline's share of the petroleum market increased very quickly. Two other uses of fuel also increased sharply during the years from the 30's to the 50's: aviation and farm equipment. The major petroleum product being produced was thus changing from kerosine to fuel oil to gasoline to accomodate the changing patterns in consumption. There was also a large increase in the use of asphalt, another petroleum product, to pave roads.

Geographic areas of oil production were also changing, from Pennsylvania and neighboring Ohio and West Virginia, to California and Oklahoma, and then to Texas and Louisiana.

Natural gas which is often found in conjunction with oil, was mostly wasted until the late 1920's, when it became technologically feasible to lay the pipeline to transport it. Natural gas was clean-burning, convenient, and cheap, and it thus became the nation's primary household fuel by 1960. Gas also found use in industry, and for electrical power generation.

After World War I, as the number of electrical appliances multiplied, growth in electrical consumption accelerated, although overall energy growth was slower. From the beginning of World War I, total electric power demand has been doubling every 10 years. In the 1920's and 1930's, coal was the fuel for about two-thirds of the electric power generated, with hydroelectric power providing the rest. The shift to oil and natural gas had changed the ratio significantly, until by 1970, coal had dropped to about 45 percent; hydroelectric power provided 17 percent; natural gas accounted for almost 25 percent; oil, about 12 percent; and a newcomer to the fuel scene, nuclear power, provided about one percent.

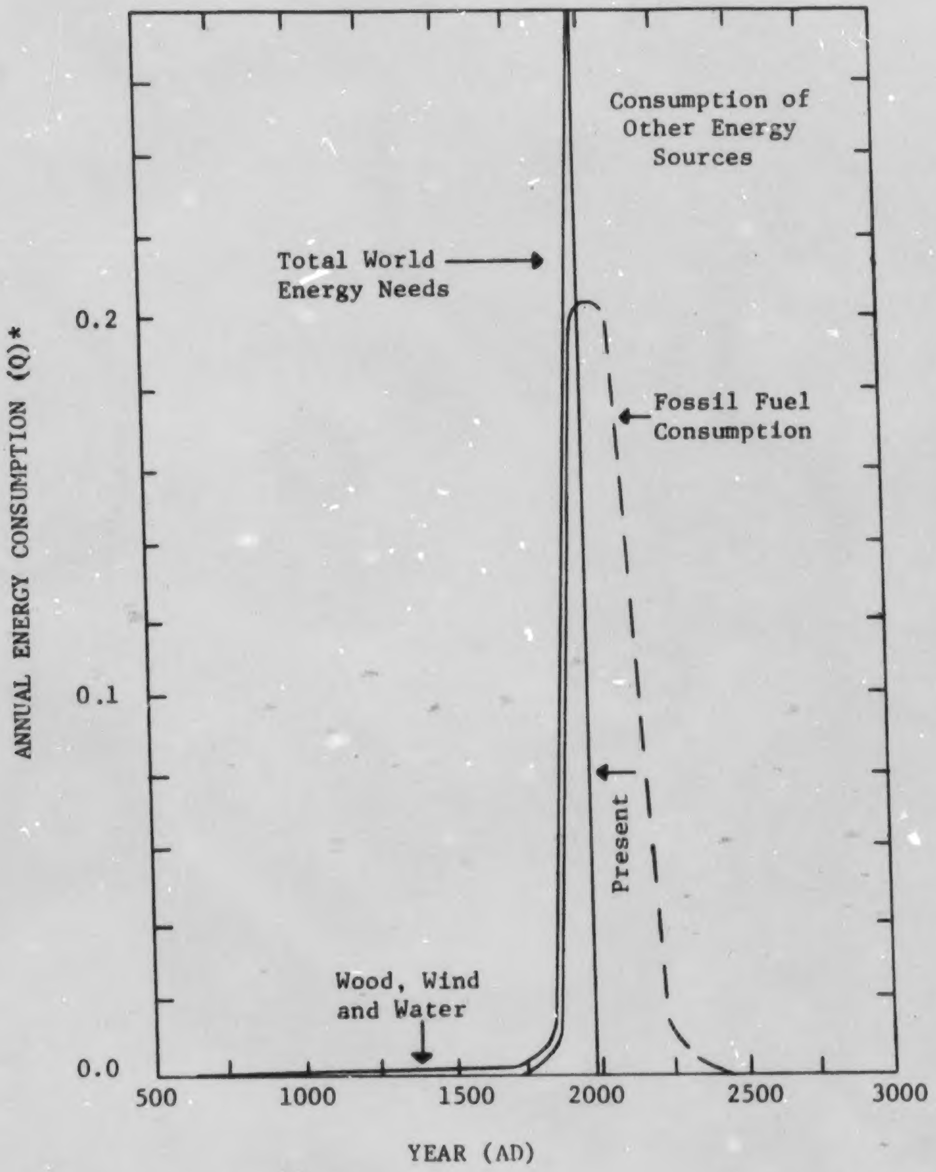
At the beginning of the 20th century, scientists were investigating the rays given off by radium. In 1905, Albert Einstein demonstrated mathematically the relationship between mass and energy, although it was decades before this theory could be proved. On December 2, 1942, a group of scientists headed by Dr. Enrico Fermi gathered under a squash court at the University of Chicago, where the first controlled nuclear reaction occurred. Scientists have since been working to safely harness that tremendous nuclear energy for the generation of electricity. The nation's first prototype nuclear power plant was built at Shippingport, Pennsylvania, in 1957.

In the years since World War II, energy consuming technology has appeared elsewhere. During this period, a huge fleet of passenger airplanes has developed; there has been an automobile "population explosion." Air conditioning, central heating, television, clothes washers and dryers are generally thought of as necessities, not luxuries. A mechanized agricultural industry uses tremendous amounts of energy. The various engines that perform America's work produced 7.5 times the number of horsepower in 1971 as they did in 1940, while the number of people in the country increased by only 54 percent. Even with the slowing population growth, more and more energy is being used.

Our country now has a fossil fuel economy. We use these fuels not only to produce energy, but also as a basic raw material for plastics, pesticides, and synthetic organic chemicals. Everyone alive today was born years after this fossil fuel epoch began, and we have tended to act as if we expect it to go on forever. But Dr. M. K. Hubbert of the U.S. Geological Survey estimates that in a period of only 1300 years from beginning to end, humans will have consumed the world's entire available supply of fossil fuels.

This is illustrated in Figure I. Thus the world today is on the brink of transition from the fossil fuel age to some future energy era. As we have seen from this discussion of energy history, humans have moved from one fuel epoch to another, not because the old source was depleted, but because something better had been found to take its place. Discovery of the new preceded depletion of the old. People did not run out of muscle or wind or animals--they simply found something better. But this time there must be a change to some other energy form, and in the meantime, until the transition is made, we must conserve the fossil fuel resources we have by cutting down wasteful uses and increasing the efficiency of what we do need to use.

Energy Timeline


WORLD ENERGY CONSUMPTION

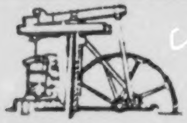
Past and Future

*IQ = 10^{18} BTU

Finish the Energy Timeline

cut

1780 1785 1790 1795



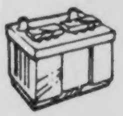
1776

In England James Watt puts two engines to work in factories & starts an energy revolution. The energy is *steam*

1783

Two men fly in a balloon at *Paris, France*. The energy used is *hot air*.

Most people burn wood for heating and cooking and travel by horse or on foot.

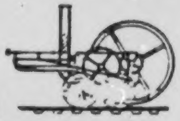


1600

In Italy, *Volta* invents the battery and gives his name to the volt. The energy produced is *electricity*

cut

1800 1805 1810 1815 1820 1825

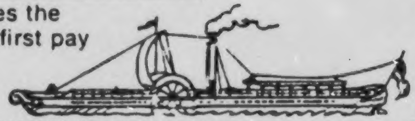


1804

An Englishman, Richard *Trevithick*, puts James Watt's engine on wheels and rails. He is the father of the railroad locomotive.

1807

Robert Fulton doesn't build the very first *steamboat*, but he makes the one people first pay to ride on.



Wood continues to supply most household energy needs. But coal begins to do more in factories and railroad engines.

1821

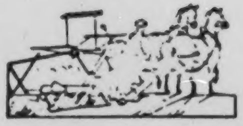
First attempt to develop and market natural gas near Fredonia, N.Y.

cut

1830 1835 1840 1845

1829 An American named *Joseph Henry* and an Englishman named *Michael Faraday* each invents a generator. Who is first? *Henry*. The energy produced? *electricity*

1837 Americans put new inventions to work. First comes McCormick's *reaper*, then the steam shovel by *Otis*, and the telegraph by *Morse*.



Railroads expand rapidly, hauling freight and passengers brave enough to stand the jolts and to risk hot cinders that often fly from the engine into their cars. England is first and America second in railroad locomotive production.

cut

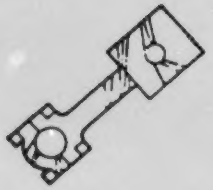
1850 1855 1860 1865 1870 1875

1859

Edwin Drake strikes oil in Pennsylvania beginning the *petroleum* industry.

1860

Lenoir of France invents the *internal* combustion engine.



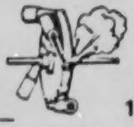
An explosion inside a cylinder paves the way for the later invention of the automobile. An oil strike hastens the discovery of the fuel that will run it.

cut

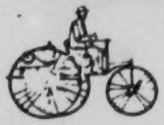
cut

1880 1885 1890 1895

Coal and wood still furnish most of the energy in homes. "Iron horses" and real ones continue to take most people places. Although the electric bulb has been invented most people still use kerosene or gaslights to read by.



1884
In England, Charles Parsons perfects the steam turbine and advances the development of electrical energy.



1886
Karl Benz builds the 1st successful automobile.

1892
The oil-burning engine is invented by Rudolf Diesel. Eventually, this engine will replace steam-powered ones.

1895
The power of Niagara Fall is harnessed to make electricity

cut

1900 1905 1910 1915 1920 1925

1903
The engine in the Wright brothers' plane is powered by gasoline

1905 Albert Einstein develops a theory for measuring energy and prepares the way for the atomic age.

1910
Ford makes the first Model T car.

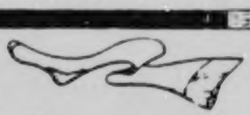
By the end of this period, many new homes have coal furnaces in the basement. And more and more cars appear in garages.

cut

1930 1935 1940 1945

1926
Robert Goddard tests a rocket

1936
Hoover Dam on the Colorado River is built to generate hydroelectric power.



1940
Nylon, a fiber made from oil, coal, and water makes its first public appearance.

1942
In Chicago, Enrico Fermi sets off the first nuclear chain reaction.

Many homes convert from coal to natural gas for heating. Most families own at least one car and some have two.

cut

1955 1960 1965 1970 1975

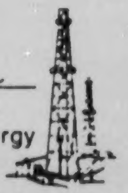
1952
Bell scientists raise hope for our energy future with the solar battery.

1957
The U.S. gets its first big nuclear electric power plant at Shippingport, Pa.

Demands for energy grow. America gets more people, more homes, more factories and businesses, more cars, more trucks, more buses, more planes. Demand grows faster than supply.

1970
Congress passes the Clean Air Act.

1973
OPEC nations embargo oil and produce an energy crisis.



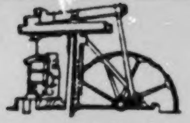
1976 Americans continue to look for ways to conserve the energy we have and find new energy sources.

cut

Finish the Energy Timeline

cut

1780 1785 1790 1795

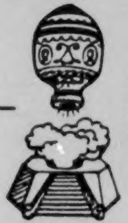


1776

In England James Watt puts two engines to work in factories & starts an energy revolution. The energy is ________.

1783

Two men fly in a balloon at ______________
The energy used is ______________.



Most people burn wood for heating and cooking and travel by horse or on foot.

1800

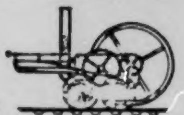
In Italy, ____________ invents the battery and gives his name to the volt. The energy produced is __________

cut

1800 1805 1810 1815 1820 1825

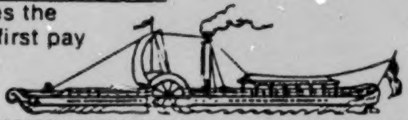
1804

An Englishman, Richard ______________, puts James Watt's engine on wheels and rails. He is the father of the railroad locomotive.



1807

Robert Fulton doesn't build the very first ______________, but he makes the one people first pay to ride on.



Wood continues to supply most household energy needs. But coal begins to do more in factories and railroad engines.

1821

First attempt to develop and market natural gas near Fredonia, N.Y.

cut

1830 1835 1840 1845

1829 An American named ______________ and an Englishman named ______________ each invents a generator. Who is first? __________. The energy produced? ______________

1837 Americans put new inventions to work. First comes McCormick's ______________, then the steam shovel by ____________, and the telegraph by ____________.

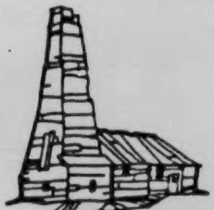
Railroads expand rapidly, hauling freight and passengers brave enough to stand the jolts and to risk hot cinders that often fly from the engine into their cars. England is first and America second in railroad locomotive production.

cut

1850 1855 1860 1865 1870 1875

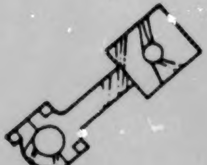
1859

Edwin Drake strikes oil in Pennsylvania beginning the ______________ industry.



1860

Lenoir of France invents the ______________ combustion engine.



An explosion inside a cylinder paves the way for the later invention of the automobile. An oil strike hastens the discovery of the fuel that will run it.

cut

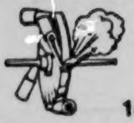
cut

1880 1885 1890 1895

Coal and wood still furnish most of the energy in homes. "Iron horses" and real ones continue to take most people places. Although the electric bulb has been invented most people still use kerosene or gaslights to read by.

1884

In England, Charles Parsons perfects the steam ____________ and advances the development of electrical energy.



1886

Karl ____________ builds the 1st successful automobile.

1892

The oil-burning engine is invented by ____________. Eventually, this engine will replace steam-powered ones.

1895

The power of Niagara Fall is harnessed to make ________.

cut

1900 1905 1910 1915 1920 1925

1903

The engine in the Wright brothers' plane is powered by

____________.

1905 Albert Einstein develops a theory for measuring energy and prepares the way for the ____________ age.

1910

Ford makes the first Model ________ car.

By the end of this period, many new homes have coal furnaces in the basement. And more and more cars appear in garages.

cut

1930 1935 1940 1945

1926

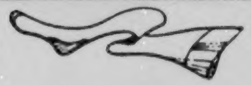
Robert Goddard tests a ____________.

1936

Hoover Dam on the Colorado River is built to generate

____________ power.

1940



____________, a fiber made from oil, coal, and water makes its first public appearance.

1942

In Chicago, Enrico Fermi sets off the first

____________ chain reaction.

Many homes convert from coal to natural gas for heating. Most families own at least one car and some have two.

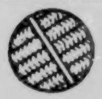
cut

1950 1955 1960 1965 1970 1975

1952

Bell scientists raise hope for our energy future with the

____________ battery.



1957

The U.S. gets its first big

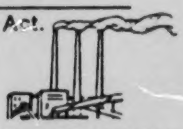
____________ electric power plant at Shippingport, Pa.

Demands for energy grow. America gets more people, more homes, more factories and businesses, more cars, more trucks, more buses, more planes. Demand grows faster than supply.

1970

Congress passes the

____________ Air Act.



1973

OPEC nations

____________ oil and produce an energy crisis.

1976 Americans continue to look for ways to

____________ the energy we have and find new ________ sources.

cut

Wichita - Sedgwick County
Historical Museum

Tour Offered for Fourth, Fifth, and Sixth Grade Classes

"A WICHITA COTTAGE"

A Wichita Victorian Home, c. 1890

A 60 minute visit to the Historical Museum's Victorian house exhibit available for single classes of not more than 30 4th, 5th, or 6th grade students

Tuesday through Friday at 1:45 pm

The class will divide into 2 groups, each of which will tour the entire 6 room house and participate in hands-on activities in the kitchen area.

Name tags are important to facilitate the activities.

The activities include:
stereoscope, hand-pump vacuum cleaner,
hand crank food grinder, apple peeler, and fabric fluter

The house tour includes:
reception room, parlor, dining room, bedroom,
bathroom, kitchen, and back porch

FOR TEACHERS USING THE ENERGY CURRICULUM, A SPECIAL ENERGY EMPHASIS TOUR IS AVAILABLE UPON PRIOR REQUEST

Please call the Museum (265-9314) at least 2 weeks prior to your date of choice in order to receive pre-visit materials.

"A Wichita Cottage"

The Victorian Cottage

A. The back porch

1. Icebox - Foods in the icebox were kept cold because they were in close proximity to a block of ice. The ice had to be replaced several times a week depending on the weather and the season. Electricity has greatly changed methods of refrigeration. It has made refrigeration easier, more convenient, and very useable as a means of preserving foods. It takes a great deal of energy to generate electricity and a considerable amount of electricity to refrigerate items. Our consumption of energy has increased greatly in the area of storing food since the time of the icebox.

2. Milk bottle carrier - People would carry fruit jars in such a carrier to the dairy farmer to get their cream. The jars would be cleaned out and reused. This practice has ended since we now buy cream and/or milk in containers that can be thrown out. Throw away containers were at first developed for sanitary reasons. This may not be as important today. The convenience they offer is very important to many people. Most people don't wish to be bothered with returnable containers. Consider, however, how much energy must go in to making the object that is to be thrown away.

3. Fireless cooker - Describe how mother would begin to cook a food item on the stove and heat the stone to be placed in the bottom of the cooker. The food item would then be placed in the cooker to continue cooking on residual heat. An efficient use of energy resources by limiting the amount that is needed to be used to cook the food. The use of the fireless cooker also kept the house cooler in the summer.

4. Fuse Box - This was where the electricity entered the house. You'll notice fewer wires because there were fewer appliances that used electricity in these homes. The use of electricity was a relatively new thing. Once people knew what electricity could do for them they invented many labor saving devices which were to be powered by electricity.

B. Kitchen

1. Woodburning stove - Could also be used as a coal burning stove. It was a very important piece of equipment in homes. It was used as a space heater

in addition to being a cook stove. It was used to heat several appliances that we now use electricity to operate. Examples are: the toaster, an iron, a waffle iron, a coffee pot, others. The energy from one piece of equipment did the work for many things. Today we use much more energy to do the work, but there is the convenience factor. The ashes from the wood could be used to make soap.

2. Pieces of equipment requiring mechanical energy -

   a. Coffee grinder
   b. Apple pealer
   c. Fluter (also used heat from the stove)
   d. Rug beater
   e. Vacuum cleaner
   f. Food chopper
   g. Lemon juicer
   h. Knife sharpener
   i. Butter churn
   j. Cherry pitter

3. Storage of dry goods

   a. So many things were stored in metal containers. The convenience of grocery stores has allowed us to get away from needing to store so many dry goods.

   b. The bin under the worktable stored quantities of flour. Dry goods were brought in bulk unlike today. We use a great deal of energy to make smaller, more convenient packages. Buying in bulk is energy efficient.

   c. Packaging - Goods were packaged in metal reuseable containers. Much of what we buy today is packaged in materials that are thrown away. In many ways this is more sanitary, but the use of throw away containers has grown more, truthfully, because of its convenience.

C. Bathroom

1. Notice the shaving mug, brush and razor. Demonstrate how a man would shave using these items. Today many men use an electric razor rather than doing the job by hand.

D. Vestibule

1. Acted as a weather stop. The cold or the heat would be stopped here. In many homes today the heat or cold from outside is allowed to enter a major living area.

E. Reception Room

1. Point out the gas and electric light fixture and describe why homes had a combination of the two.

2. Portiere work - Could allow for air circulation between rooms even though it wasn't designed for that purpose.
3. Drapes could be closed to keep out drafts.
4. Height of ceilings would allow for circulation. As hot air rose, cooler air would fill the void.
5. Use of ceiling fans to waft warm air down.
6. The dark wallpaper would help keep a room cool, but it would require more artificial lighting.

F. Parlor

1. Entertainment - use of hand operated or mechanical objects -
    a. Pump organ
    b. Victrola
    c. Organette
    d. Stereoscope
2. Furniture could be moved around the room to utilize light sources.
3. Tall windows allowed for air circulation and lighting.
4. Curtains - Sheers would allow light to enter the room. Heavy drapes would insulate against heat gain or heat loss.
5. Heavy carpeting provided warmth to feet in the winter. Rush matting provided for coolness in the summer.
6. Hand fans were used to help cool people much as electric fans are today.

G. Dining room

1. The pendulum clock was wound by hand.
2. The fireplace was used for decoration. Heating was supplied by a coal burning furnace located in the basement. Convection currents carried the heat up through the heat vents and the cooled air would sink and return to the furnace through the cool air returns.

H. Bedroom

1. Transom - Allowed for air circulation
2. Tall headboard - Shielded head from drafts.
3. Treadle sewing machine - Operated by foot power.
4. Handmade quilts provided warmth for beds as do our commercially made blankets today.

5. Wardrobes were used instead of building smaller spaces for closets. Fewer small areas to be heated or cooled.
6. Basin, bowls, commodes - Allowed for fewer bathrooms in a house.
7. Kerosene lamp - Use of coal oil for lighting.
8. Horsehair used for stuffing mattresses - Use of natural fibers.

Energy: A National Issue

The main characters of this animated film narrated by Charlton Heston are Fred and Wilma Flintstone. Although it might appear that the film is geared to young children, the content is thorough enough to be of value to adults. The content is interspersed among catchy tunes, simple story lines, and the magical wizardry of animation. The viewer must pay close attention to hear all the facts presented.

The film begins with some basic definitions of energy and a discussion of the formation of fossil fuels. Oil is the primary energy resource discussed throughout the film.

Throughout the film, the viewer will note statements that show the relationships between the use of energy and its consequences. For example:

1. Nothing is for nothing. You can't gain useful work from energy without reducing something else to get it.
2. If we keep using up the oil we will run out of it. If we stop using it we will ruin our economy.

Some of the statistics presented in the film will be out of date since the film was produced in the early 1970's. However, these give the viewer an idea of the extent to which we use energy in industry, homes, for transportation and so forth. A convenient measurement, BDOE (barrel of oil a day or its equivalent) is used throughout the film to depict the amount of energy that has been used in the United States in the past and its predicted use in the future.

A concern is stated about the depletion of natural resources, specifically oil. Several ideas such as conservation, more efficient use of energy and searching for new sources of energy are suggested as possible ways of contending with the problem.

The information provided in the film should be an excellent basis for much discussion on the energy issue.

A Walk Through the Past

Instructions:

Come to Historic Wichita's Cowtown for an unforgettable excursion into the past. Five original buildings are over a century old; others are restorations or reproductions faithful right down to furnishings, fixtures, tools, utensils, and clothing of the times. Most buildings can be entered, so you can "relive for a few hours" the way people lived, worked, worshipped God, and educated their children back in almost any western frontier town.

A tour of Cowtown enables students to observe the lifestyles of Wichitans one hundred years ago. Teachers may call the the Cowtown Museum to schedule a tour. With a cutback on funds, the Cowtown office cannot promise a tour guide (docent) for every group scheduled. In place of a docent, a walking tour guide has been written to inform the teacher and students of the historical background of the buildings. The Energy Adventure Center can supply teachers with a written guide for an energy tour of Cowtown. Using both guides, the teacher can conduct a very educational tour.

A Walk Through the Past

The admission charge is generally $1.00 for children 5-11 and $2.00 for all others. However, if the group contains 15 or more people, the charges are reduced to $.50 for students in grades K-6 and $1.00 for all others.

Address: Historic Wichita Cowtown
1871 Sim Park Drive
Wichita, KS 67203
Telephone: (316)-264-0671

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

COWTOWN TOUR - FIVE BUILDINGS

Buildings to visit:

Munger House	Jail	Sod House
Schoolhouse	Church	

Questions:

1. How did they light their homes?
2. How did they heat their homes?
3. What were some of the types of clothing worn?
4. How was their food prepared?
5. What materials were used to construct the homes?
6. What kinds of transportation were available?
7. What kinds of schools did they have?
8. What kinds of churches did they have?
9. What did they do for leisure--hobbies, spare-time activities?
10. Describe the types of jobs available back then in the 1800's.

COWTOWN TOUR - FIVE BUILDINGS

Since we are privileged to use Cowtown free of charge on our energy tours, please be sure to only use the buildings mentioned in this guide.

1. As you enter the Cowtown area you will walk on wooden sidewalks and observe gas lamps used for street light. Ask your students why they would have had wooden sidewalks in early Wichita. Their response might be that they didn't know how to make cement. A more correct answer would be that they used what building materials were available to them. The gas lamps show a conversion from chemical to radiant forms of energy. Why wasn't electricity used in 1865?

2. You will pass through the Woodman House (Cowtown offices) where you will pick up the key to the Red Schoolhouse.

3. Once you exit the Woodman House, which is a replica of the original building, you will notice an area where there is a windmill, several covered wagons, a pile of wood, etc. Ask your students to name several forms of energy they see there--

   wagon wheels--mechanical

   windmill--mechanical

   wood--chemical
   etc.

   Then ask them to name the renewable resources of energy they see being used.

   wind--by the windmill

   solar--as shown by sunlight

   wood

   What non-renewable resources of energy are being used? None. What do you conclude about what resources of energy the early settlers used? How has that changed today?

4. Walk on to the Red Schoolhouse. This is a good place to notice forms and converters.

   A. Forms and Converters

      1. Forms

         a. Mechanical
            - clock
            - organ

b. Chemical
   - woodburning stove
   - gas lamp

c. Radiant
   - sunlight through windows
   - gas lamp

d. Thermal
   - woodburning stove

2. Converters

   a. Organ - mechanical to sound

   b. Gas lamp - chemical to radiant

   c. Woodburning stove - chemical to thermal

B. Heating and Cooling

   1. The high windows played an important part here. They would let in a great deal of sunlight to heat the room. The windows would open up from the bottom and let down from the top allowing the hot air to escape out the top and the cool air to come in from the bottom. This allowed for air circulation.

   2. The woodburning stove was also used for heating. How is it different from our furnaces today?

C. Lighting

   You'll notice electric lights at either end of the building, but they weren't there in the original building. The high windows let in a great deal of light, and there was also the gas lamp.

D. Transportation

   Students traveled to and from school by walking, by riding horseback, or by riding in a wagon pulled by horses. Compare this with how children come to school today. Compare the energy used.

5. The Jail, also known as the callaboose, is as it would have looked about 1871. It was not designed to be comfortable.

   A. Heating and Cooling

      1. There was no heating. People have been known to freeze to death in the jail. Notice the construction of the building. There was no chinking between the boards, so air went through cracks in the walls. What keeps cool air or warm air from coming into your house when you don't want it? (Insulation) This building had no insulation.

2. The only way to cool the jail in the summer was for air to come through the vents above the door and below the roof on the side walls. The small spaces trapped the heat and were therefore difficult to cool.

B. Lighting

The only light that entered the jail was through the vents, the peepholes in the doors, or the cracks in the walls.

6. The Munger House was built in 1868. It was considered very modern by all standards in those days.

A. Exterior of the house

1. Mr. Munger built the house with the help of his family. They used the materials they had available to them. These were lumber from the cottonwood trees that grew along the banks of the Arkansas, and chinking he made by mixing mud, sand, clam shells and water from the river and combining it with buffalo hair to act as a binder.

2. Look at the rough hewn boards and consider the amount of work that went into constructing the house using little more than an ax as a tool and your hands. The chinking between the boards was used as an insulating material to keep the cold air or the hot air out of the building.

3. The hardware and windows had to be brought in from Emporia by wagon. It took about 10 days to get materials as they were needed, quite unlike today when we can run to the lumber yard or hardware store.

4. Notice the placement of trees to shade the house and keep it cool.

B. Size of house

It is rather small. The rooms are small so that heat could be contained in a small space requiring less energy to insulate the house. We know that heat rises so the bedrooms were put upstairs to take advantage of the heat as it had risen during the day during the winter. By morning it could be pretty cold so people wore extra clothing to keep warm. People in those days adapted their bodies to the weather more than we do today.

C. Kitchen

1. Lighting

Notice the large window next to which much of the work was done. Also notice the kerosene lamps on a swivel so that light could be directed where it was needed.

2. Woodburning stove

The woodburning stove was used as a cookstove, hot water heater and furnace.

3. Packaging

Notice the canisters for the flour and meal hanging on the side wall. They are very large indicating that goods were bought in bulk. Also notice the canned goods and the foods dehydrating and hung from the ceiling. Why couldn't Mrs. Munger go to the store as often as we can today?

4. Appliances

There were no electrical energy consuming appliances. Everything was done by hand-operated appliances.

D. Living and dining room

1. Lighting

Tall windows and kerosene lamps were the sources of light.

2. Heating

Look at the woodburning stove in the living room. Notice its size--much smaller than our furnaces, but it wasn't used to heat as much space. Notice that the family activities were done in the living room area. Family members didn't spread out their activities in so many rooms of the house as we do today.

3. Insulative value of the drapes

The heavy drapes were closed during the day in the summer to keep the heat out, and at night in the winter to keep the cold out. Lighter curtains allowed light into the room for lighting and heating purposes in the winter.

4. Closet space

No little, separate areas were set aside for closets. Clothing was hung on clothes hooks or put in trunks for storage.

E. Cut out space to show how wall was constructed

Mr. Munger used the twigs that he had chopped off the tree trunks as he was making the lumber for the outside walls to reinforce the inside walls. The twigs were encased in the chinking mixture he had also used on the outside of this house. This masonry helped to keep the house cool in the summer.

You'll find the cut out space at the top of the stairway.

F. Bedrooms

1. The bedrooms are small and very compact. Notice that they surround the open stairway so that they can be exposed to the heat rising from the kitchen.
2. Since there is no bathroom in the house, notice that people washed themselves using basins of water filled from the pitchers stored inside the basin. The water had to be pumped from an outside well.
3. Notice the handmade quilts used for bed covers. and the hand braided rugs used to keep feet warm.

7. The Old Schoolhouse served several purposes. It was a school during the week, and a meeting house at other times. The building originally had no windows and could have been constructed into the side of a hill. You cannot enter the building because of problems with the roof.

A. Roof

The significant energy part of this building is the roof. Notice that it is covered with soil out of which are growing cactus. This type of roof had great insulative value.

B. Exterior of the building

Also notice the chinking between the boards of the outside frame of the building.

8. The Church was built around 1870 and was Wichita's first frame constructed church building. It has served as a Presbyterian Church, a Catholic Church and a rooming house.

A. Cooling

Notice the tall windows allowing for air circulation. These were explained in the Red Schoolhouse.

B. **Lighting**

1. Notice the tall windows.
2. The kerosene lamps have reflectors behind them. These reflectors increase the amount of light given off by the lamps.
3. Notice the white paint on the walls. The light color reflects light, thus increasing the amount of light in a room.

C. **Organ**

The organ is an example of a converter--mechanical to sound. It was operated by foot power.

D. **Floor**

The energy conservative floor was put together with wooden pegs rather than nails. This shows the use of a renewable resource of energy.

These are the buildings we have contracted with Cowtown to use. Please don't ruin our chances of keeping a free tour by visiting more buildings than we have been allowed. Your help with this is greatly appreciated.

COWTOWN TOUR - OUTLINE

Choose one or more of the following activities to work with:

1. On the ride to Cowtown, check for signs of energy forms, sources, converters, and for use of energy in our everyday lives.
2. Upon arriving at Cowtown, begin recording signs of energy, forms, sources, converters and/or use of energy from the past.
3. Compare and contrast the present users of energy to the past users of energy in a certain area - i.e., stagecoach and horses in the past compared to buses and cars today.

TOUR OUTLINE:

Jail:

- No heat, no cool, just some venting

Munger House:

- Design of house - 6 rooms
- Shade--Cottonwood tree
- Wagon train--10 days getting hardwood from Emporia
- Built by himself with help of family
- Bedrooms upstairs because heat rises
- Forms of cooking, heating, lighting
- Small area, used less energy to insulate, each needed less space to live, woodburning stove--form of heat, masonry in walls, keep house cool in summer
- Not very finished off, rough finish, don't need painting scrubbing
- Area rugs for cold feet
- Lot of big windows, instead of lighting

- People adapt body to weather more than they do now
- Family around the stove--type of family life, spent leisure time
- Less processing
- Kitchen--bought in bulk, flour and meal containers on wall, lye soap, no energy consuming appliances, hand-operated appliances, wash basin
- Plaster ceiling--keeps temperature constant, thermal mass, big mass that soaks up heat, moderates temperature
- small double beds
- less space use, more energy saved--no utility room, garage
- Now demand more space
- Now everybody has what only the rich had then

Horse Thief Cabin:

- Hewn logs, candle--form of lighting, non-metal lock--hand-made

Schoolhouse:

- Building design--dug back into the ground first, wood front, grass on top
- Finn--school teacher, put windows in, dirt floor
- Gas light, shiny pan to reflect light to make it brighter--reflector
- 1 piece of wood per child for heating
- Only learned basics at school, rest of education was on-the-job training in apprenticeships for 5 to 10 years

Church:

- Fans for cooling
- Pump organ, foot-powered
- Woven rag rugs
- Kerosene lights, original reflectors--direct light toward reading people
- Wooden pegs instead of nails, energy conservative floor
- Handwoven rugs

COWTOWN TOUR - OUTLINE

- Carpenter built pulpit, etc.
- Church was really important, not much else to do
- Rooming house up until 1940's
- Murdock bought church--took parsonage also--3 room house
- Rope along bottom of bed, feather bed vs. mattress of today, straw, grass, and feathers
- Woodman bought Munger House and made it bigger--Lakeside (Entrance of Cowtown), put heating and cooling in it
- Street lights--fill up and light kerosene first, then natural gas
- No airconditioning
- No loudspeaker
- Skinny windows--in summer open top one and let heat out
- Roof--wood-shake (shingled) roof-renewable resource compared to asphalt--non-renewable

Parsonage:
- Old iron stove, cast-iron kettle, fireplace, coffee grinder, sewing machine, old pump organ, zither, ropes--bed springs, mattress stuffing, corn shucks, hay

The Story and a Half House:
- Billy the Kid's house
- Overhead oven on kitchen stove, old laundry equipment

Honeymoon Cottage:
- first people who got married, had 5 kids
- Small area
- Stove with heating oven above it

The Little Red Schoolhouse:
- Form of heat--big fire started by the teachers
- Way to school, transportation--walking, horseback,

pony, buggy/spring wagon--carpool

- More light from windows
- Stove for heating
- 3-dimensional maps
- Stereopticans--entertainment
- Wind-up clock
- Gas ceiling lamp

Carpenter Shop:

- People had fewer furnishings which they would keep longer
- Carpenter tools, woodworking, cabinet making, stone and brick mason tools, hand-operated, hand-tooled, foot-operated

I.W. Gill and Sons Undertaking Parlor:

- Mortuary lights
- Coffin--1880's and 90's, carving, lining, wood used nailed down
- Horse-drawn hearse
- Built by carpenter, 9th and Waco
- Stained glass windows
- Bench outside--form of leisure
- Simpler ceremony

The Wichita Eagle (process):

- First paper--very small print
- 2 men ran the press-Washington Hand Press
- Set up type by hand
- Cut apart with scissors
- Typewriter
- Less mass communication

Dorothy's Dress Shop:

- Apparel of the time represented
- Not a lot of choice

- One or two good outfits/woman per year, more of a standard uniform, dark clothes
- Kerosene light

Law Office:

- Heat, stove, two way--heating and cooling, Blase Burner

Post Office:

- 1868 map of Kansas
- Form of heat--coal, twisted grass, buffalo chips
- When the train came into the picture, wood was hauled in
- Everybody came here instead of mailman going around

Barber Shop (process):

- Barber pole, lay back, straight razors vs. electric
- Mix in shaving mug vs. shaving can of today, bath part, heat water for bath

The Joseph P. Allen Drug Store:

- Glass urn--apothecary jar hanging in window--sign that building was a drugstore
- Doctors business in there also
- Pill, rolling device, mortars
- More basic medicines, take less energy

The Buckhorn Bar:

- Original buildings--saloon
- Old player piano
- Old cash register
- Display of slot machines, roulette wheel
- Drugs used, locoweed, cocaine
- 75 saloons in town

Doctor's Office:

Dr. Fabrique, early day furniture, forms of heat, Motorized facilites, operations--amputations

Southern Hotel:

- $1.00/week--food, room not by yourself--6-8 people in a room, high density living
- First 20 years--no hospital, hotel instead, if you didn't have a home

Santa Fe Railway Depot:

- Mass transit
- Stagecoach, horse for short distances, horse and buggy, fewer trips--they travelled together, carriage to hotels or homes, equipped with side curtains to protect passengers against wet or inclement weather and kerosene lamps which were ornamental as well as useful
- Old press, stove, typewriter, telegraph keys, lanterns
- Santa Fe to Newton
- People of Wichita built their own railroad
- For a few years, Wichita was known as the Queen of the Cattletown
- Old-time cattlecar
- Kansas--corn country first, then wheat (Mennonites)

The Museum:

- Edison phonograph, loom cradles, planters, cultivators, grindstones

Implements:

- Muscle was important
- Grinding stones
- Breaking plows
- Corn sheller
- Corn grinder
- Seeder

- Horse-drawn mower
- Corn sled
- Ice plow
- Slip and fresno
- Manure spreader
- Substitute energy for labor

Stagecoach:
- Original, mechanical energy

Indian Exhibit Building:
- Sinew (stringy part of meat), sewed beadwork, artifacts, modes of travel--canoe, hide scrapers, hides, clothes, hut, contrasting life styles--permanent home (grass house) moving around (tepee)

Blacksmith Shop:
- Old time forge
- Hand tools
- Hand-operated bellows
- Anvil
- Vises
- Wooden wagon jack

Wells Fargo Express Office:
- Structure--floors
- Stove--pot-bellied
- Kerosene lamps and lanterns

The General Store:
- Department store of rural America, pack peddlers, wagon peddlers, permanence, specialization of modern day merchandisers

- Stocked and sold groceries, meat, clothing, hats, dry goods, shoes, kerosene, dishes, pots and pans, carried stoves, bath tubs, hardware and a full line of appliances as were then available, stove utensils

Windmills:

- Water from well
- More we have, more we use, more energy we need

Bank:

- Change storer - equipment
- Bank important at that time, because of gambling, cattle
- Less lighting

The Chisholm Trail Gun Shop:

- Foot-operated lathe, a treadle, gun used for source of food, protection usage also
- Shell loading device
- Foot-powered grinder
- Hand-made guns

Lawrence Thompson Exhibit:

- Spinning wheels, branding irons, homemade rat trap, carpet beaters, straight edge razors
- Barbed wire took the place of hedges, uses more energy to make and put up and keep up, but is quicker
- Old washing machine
- Old-time movie projector, lantern
- Auto-harp
- Phonograph cylinders
- Materials to make cloth clothes, didn't wash clothes very often
- Old storage battery for wind charger

COWTOWN TOUR - OUTLINE

The Library:

- Lack of reading lights
- Area rugs
- Lanterns
- No humidity control
- Dark clothing
- Usage--everybody read same types of books back then

COWTOWN SLIDES

1. Entrance to Cowtown - shops - contrast/compare to those of today.
    - boardwalk - contrast to sidewalks of today.
    - hitching post - mode of travel, parking lot of that time.
    - street light - form of energy.
    - permanent wood awning of buildings - shade over sidewalk kept goods from fading from the sun.
2. Street light - form of energy.
    - Tepee - home design.
    - Medicine show - travelling wagon.
3. Train-locomotive - fuel - coal, oil, wood → burn → produce steam.
4. Closer view of tepee (construction), train.
5. Front view of tepee - top opening for smoke.
6. Munger House - construction.
    - materials available from environment surrounding the house.
    - Didn't get anything from the train.
7. Mrs. Munger - dress of this time period.
8. City Hall - City meetings, get-togethers used for everything the church wasn't used for.
9. Docent at Cowtown - dress of this time period.
10. Process - Quilting - forms of energy involved.
11. Ladies quilting - dress of this time period.
    - This is something that is still done today.
12. Quilting - another view.
13. Finished products - quilts.
14. Finished products - quilts.

15. Process - Making soap - forms of energy involved.

16. Process - Water dowsing.

17. Water dowsing - bent twig.

18. Process - Spinning your own wool - forms of energy involved.

19. Spinning wool.

20. Spinning wool - finished products being displayed.

21. Spinning wool.

22. Process - Making apple cider - forms of energy involved.

23. Making apple cider - cider press.

24. Making apple cider - cider press.

25. Process - Making rope - forms of energy involved; equipment needed.

26. Making rope - spool of hemp.

27. Making rope - finishing off the rope.

28. Making rope - finished product.

29. Process - Shearing sheep - forms of energy involved; equipment needed.

30. Shearing sheep - equipment.

31. Shearing sheep.

32. Shearing sheep.

33. Career - Blacksmith.

Process - Smithing - forms of energy involved; equipment needed:

forge
anvil
bellows
hammer

34. Smithing.

35. Smithing.

36. Products - wooden swing in frame.

COWTOWN SLIDES

37. Products - wooden loveseat.
    tool - ax.
    resource - wood.

38. Process - Wood carving - forms of energy involved; tools needed; resource - wood.

39. Products - wooden spool mobile - energy being recognized, movement/change.

40. Products - display of wood carvers' work.

41. Products - side view of display.

42. Products - front view of display.

43. Process - Caning chairs - forms of energy involved.

44. Transportation - locomotive.
    types of fuel - coal, oil, gas.

45. Locomotive - front view.

46. Transportation - stagecoach.

47. Stagecoach - forms of energy involved.

48. Recreation - skipping rope - forms of energy involved.

49. Recreation, entertainment - hoop racing - forms of energy involved.

50. Hoop racing.

51. Hoop racing.

52. Hoop racing - buildings in background.
    construction - comparison/contrast.
    types - sod house, wood house.

53. Music, entertainment - Dulcimer - forms of energy involved.

54. Dulcimers - compare to instruments of today.

55. Dulcimers - contrast with instruments of today.

56. Dulcimers - What is used instead today?

57. Blank - separation for following single object slides.

58. Windmill.

59. Water pump.

60. "Solar clothes dryer" - clothes on washline.

61. Kerosene lamp.

62. Pump organ.

63. Wet cell battery - not in this time period-1865 to 1880.

64. Slide projector - lantern for light.

65. Spinning wheel.

66. Shotgun sheller - manual.

67. Feed mill or cutter - broom corn.

68. Farm equipment - implements.

69. Steam-powered pump in fire engine.

70. Stagecoach.

71. Bench for community interaction, visitation.

COWTOWN SLIDES

STUDY GUIDE:

I. Some questions to ask the students while viewing the slides.

   A. What is it?
   How does it work?
   How old is it?
   Who used it?
   What's it made of?
   What do we use in its place today?

   B. If you had to choose to do __________ or __________, what would you choose and why?

   C. When was this used and where?

   D. What are some of the similarities/differences between what was used then and what we use now?

   E. What changes have been made through the years?

II. Suggested areas to cover while discussing the slides.

   A. Forms of energy being represented in the various slides.

   B. Resources being represented.

   C. Compare the processes of the past to the present.

   D. What do you have in your environment that is similar or serves the same purpose as a particular object in a slide? What form of energy does it use?

III. Methods of clarifying the concept being discussed.

   A. Contrasting/comparing.

   B. Explaining.

   C. Questioning.

   D. Evaluating a situation.

   E. Developing an anecdotal story for the student to relate to.

Oral History Interviews

Instructions:

The students can conduct oral history interviews of senior citizens to learn about energy use in the past. Use the booklet "An Oral History Primer", available from the Energy Adventure Center, to orient the students to oral history procedures. Have them prepare a guidesheet/checklist of their own or use one or more of the attached forms on their visit with senior citizens.

Arrangements for the visit should be made two weeks in advance. In Wichita, teachers may call the RSVP (Retired Senior Volunteer Program) office. You will need to supply the following information:

Teacher's name
Telephone number
Grade level
School
Address
Room number
Number of students
Date and time senior citizens are wanted
Number of senior citizens desired
Topic the senior citizens will discuss

Oral History Interviews

You will be asked to provide parent volunteers to drive the senior citizens to and from the presentation. You are also encouraged to involve more than one class of students in the presentation. It may be that the senior citizens may speak to only one class at a time, but to utilize their services more extensively, it is recommended that they meet with more than one class at each school.

If tape recorders are available, you may want to tape the conversation with the senior citizens. Permission to tape interviews should be obtained first from the senior citizens. You may also want to take pictures during the interviews. These may be helpful in the use and presentation of the material gathered from the visitation.

Contact: Jackie Lugrand
Retired Senior Volunteer Program
RSVP
212 N. Market
Wichita, KS 67202
(316)-263-1252

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Oral History Interviews

The following categories and related questions might give you some ideas for topics to discuss with senior citizens. They should be considered as a springboard to further questioning. No doubt you and your students will think of many questions you'd like to ask that are not suggested here.

Clothing:

1. How did the weather, the seasons, or certain special occasions influence the type of clothing you wore? Did you dress to keep warm or cool, or did you dress just to be in style? What type of clothing was in style when you were young?
2. Were most of your clothes sewn at home or were they bought from a store? If your clothes were sewn at home, what tools were used to make them? If your clothes were bought from a store, were there many styles from which you could choose?
3. What materials were used in clothing? How were clothes kept clean? What kind of a washing machine did you have? How did you heat the water? What were soaps like? Could they be bought in the store or were they made at home? If made at home, how were they made? How were clothes dried?

Communication:

1, How did you keep in touch with other people when you were growing up?
2. Describe the kind of radio you had when you were a child.
3. Describe the type of television you had when you were a school age child.
4. Was your mail delivered to your home? Where was your mailbox? How often was mail delivered?

Food:

1. What kinds of utensils did you have in your home to help you prepare food?
2. How did you keep food from spoiling?
3. What kind of stove and what kind of fuel did your family use for cooking?
4. How was water obtained for washing dishes and preparing food?
5. What kinds of groceries were available in the grocery store (general store)?
6. Plastics are used so much in packaging today. What materials were used to package food when you were a child?
7. Explain the types of food processing that were done when you were a child, i.e.--canning, dehydrating, curing, etc.

Land:

1. Land can be used for many things--pastures, fields, parks, housing areas, parking lots, industrial parks, shopping centers, etc. How was the land used when you were growing up?
2. What kinds of industries (factories) were already in operation which might have misused or abused the land or polluted the streams when you were a child?

Leisure (Use of Time):

1. What kinds of entertainment did you enjoy?
2. What forms of recreation did you have available to you when you were young?
3. How much energy was used in these recreation activities?
4. Describe what you considered to be leisure time when you were a child.
5. What types of activities did you do during your leisure time as a child?
6. Describe what you considered to be a vacation.

Oral History Interviews

Money:

1. Describe the types of jobs for which you were responsible and the allowance, if any, you received for doing them?
2. On what types of activities did you spend your money or did you save it?
3. If you spent money on activities, what kind of energy did these activities require?
4. Explain the type of training you received in management of money.

Shelter:

1. How was your house heated? What kind of fuel was used? How long did it take to heat the house from the time the heating unit was activated to the time the house was warm? Did you close off parts of the house to keep other parts warmer?
2. How did you keep yourself warm in the winter. What kinds of blankets did you have on your bed? How were they made?
3. How was the air circulated throughout your home?
4. How did you cool your home in the summer?
5. How was water heated for bathing and laundry?
6. What type of lighting did you use in your home?

Transportation:

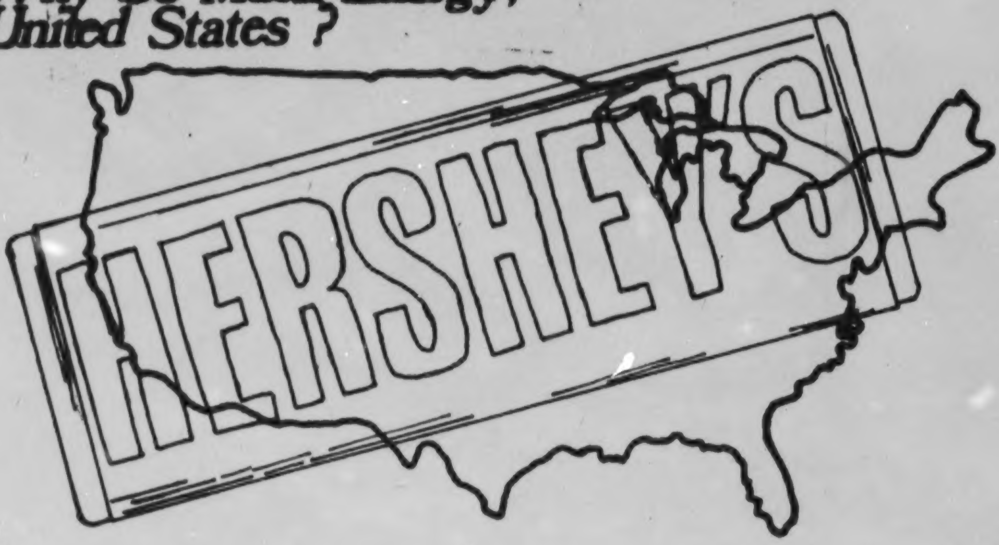
1. What methods of travel were available to you during your childhood? How did you get to school, the store or church?
2. What was the make (Chevrolet, Ford, etc.) of your family's first car? How much did it cost?
3. What were roads like when you were a young child?
4. We transport many products by truck today. How were they transported when you were a child?
5. What types of fuel were used to operate transportation vehicles.

6. Describe the types of trips you took as a child. How far away from your home did you travel?
7. What kinds of sidewalks, roads, bridges, etc. were being used during your childhood?
8. How close did you live to neighbors? To stores? To schools? To churches? To hospitals?
9. What place did you visit most often in your childhood?
10. In what ways did the invention of and/or use of the car change your town or city?

Conclusion:

1. In what ways is life more enjoyable for you now that we have electricity, plastics, detergents, and other oil and natural gas products?
2. In what ways did you like the "good old days" better?
3. Do you think that we will be able to take care of energy problems in the future as we have in the past? Do you foresee a need to change back to a more simple lifestyle than we have now? Do you think people today will be able to adapt to the changes as they did years ago?

Why So Much Energy, United States ?



Instructions:

This table shows the energy used by different categories of nations for the year 1975.

	Percent World Population	Percent Energy Use
Less-developed countries	50	2
Developing countries	25	13
Industrialized countries	19	40
United States of America	6	45

Examples of nations for the different categories:

Less-developed countries:
Ethiopia, India, Turkey
Developing countries:
S. Korea, Taiwan, Mexico, Spain, Israel
Industrialized countries:
Japan, Switerland, France, U.S.S.R., U.K., Australia, Sweden, Canada

Why So Much Energy, United States?

1. Use a large Hershey bar to represent the percent of energy use.
2. Use four different colors of paper to represent the four groups above in the percent of world population.
3. Cut the paper into enough strips so that each class member can have one. The proportion of the various colors should be approximately equal to the world population figures (i.e., one-half of the strips should be the color representing the less-developed countries and one-fourth should be the color representing the developing countries, etc.).
4. Put the strips of paper into a container.
5. Have each student pull a strip of paper to determine to which group he/she will belong.
6. Take the large Hershey bar and cut it into four sections equal to the percentage of energy use (2%, 13%, 40%, and 45%).
7. Give the appropriate section of candy to each group to divide among themselves. (The U.S.A. group should receive almost half of the bar.)
8. Have the class members share their feelings toward their group's particular portion and toward the groups who had larger or smaller portions.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

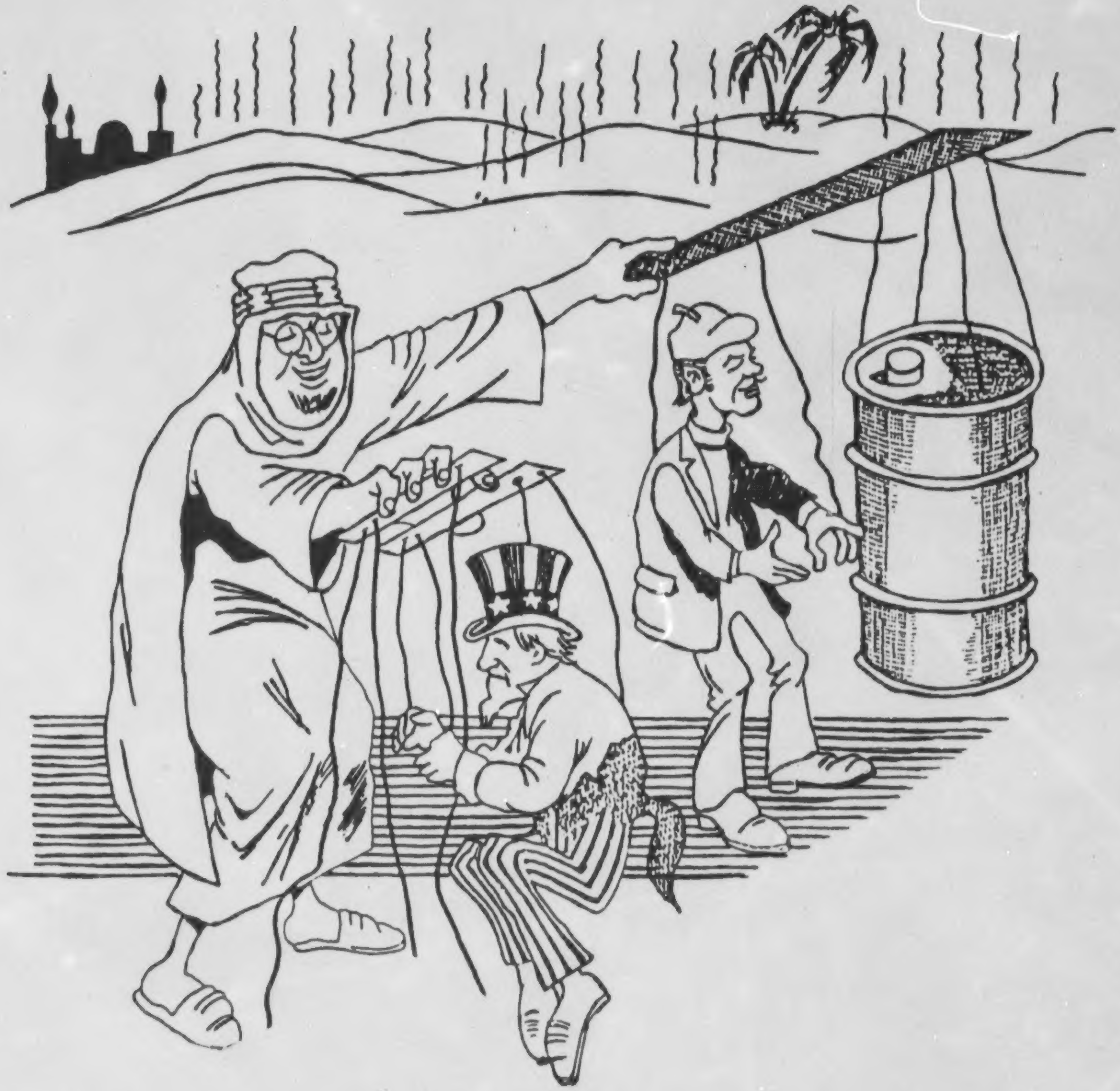
Why So Much Energy, United States?

1. Instead of a Hershey bar, you might want to use M and M's. It easier to be a bit more accurate with exact amounts for the percentages of energy used.

2. Additional questioning you might care to use with this lesson.
   a. Most of the people in the lesser developed nations may not be totally aware of what they are missing, but the leaders of the nations are. What would you do if you were the leader of one of the lesser developed nations? How would you try to improve the life of the people of your country? Would they be able to accept a change of lifestyles? Would tradition or religion stand in the way of change? How would the people be educated to make change possible? How would the economics of the country change?
   b. Values type questioning:
      1. Who owns the resources?
      2. Should anyone get rich off of the resources at the expense of others?
      3. What responsibility do we have to each other and future generations?
      4. What responsibility do we have to the rest of the world?

3. Questions you feel are important.

OPEC



Instructions:

The Organization of Petroleum Exporting Countries is more commonly known as OPEC. It's thirteen members represent the world's major oil producing and exporting countries. We will divide the OPEC members into two groups.

OPEC

Group A	Group B
United Arab Emirates	Indonesia
Qatar	Iran
Kuwait	Iraq
Saudi Arabia	Nigeria
Libya	Algeria
Gabon	Venezuela
	Ecuador

Group A countries have relatively small populations, large oil reserves, limited other natural resources, and limited social development programs. Group B countries have relatively large populations, more diversified natural resources, and more articulated social development programs.

1. What effect might these factors have opon each nation's oil production and pricing policies?
2. Can you locate these OPEC nations?
3. Which members are considered Persian Gulf countries?
4. What is the major religion of nine of the thirteen OPEC nations?

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

EAC

PRESENTS

The Oil Weapon

(Parts 1 & 2)

No. 1721

60 min.

Instructions:

This film will help the students:

Part 1

1. Understand the international aspects of oil as an economic weapon.
2. Understand capital flow and the balance of trade.
3. Learn about the effect of oil prices upon the inhabitants of the oil-rich Arab countries.

Part 2

4. Understand the new international balance of trade and power resulting from the plentiful oil supply in the Arab countries.
5. Become acquainted with the Moslem religion as a major influence.
6. Question the wasteful ways of the western world.
7. Become acquainted with the Shah of Iran.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

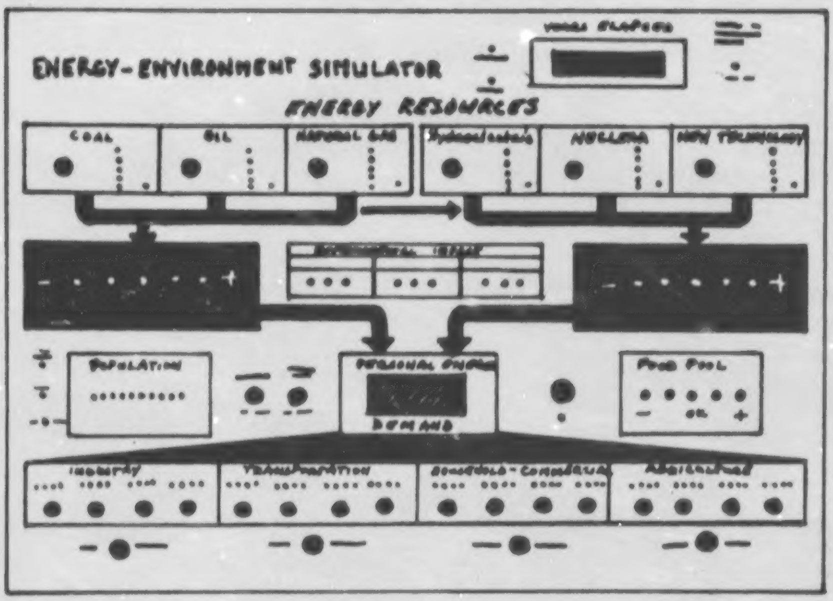
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Energy- Environment Simulator


ENERGY-ENVIRONMENT SIMULATOR
YEARS ELAPSED
ENERGY RESOURCES
COAL
OIL
NATURAL GAS
Hydroelectric
NUCLEAR
NEW TECHNOLOGY
POPULATION
PERSONAL ENERGY
DEMAND
FOOD POOL
INDUSTRY
TRANSPORTATION
HOUSEHOLD-COMMERCIAL
AGRICULTURE

Instructions:

The Energy-Environment Simulator is an appealing method of acquainting all ages with energy-environment related problems. The simulator is a tool requiring interaction by the audience in decision-making. The players must distribute the world's energy resources to supply the world's growing energy requirements. The computer poses problems, acts according to the students' decisions, and forces them to try out ideas for conserving non-renewable resources while maintaining a reasonable standard of living and a moderate level of environmental pollution.

Your facilitator will be available to help you set up the machine and explain its functions.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

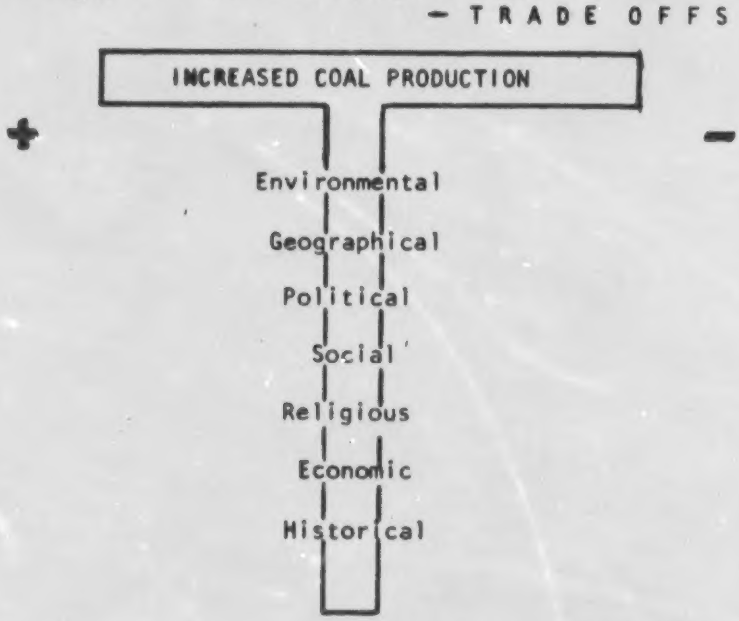
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Future Energy Problem Solving


- TRADE OFFS
INCREASED COAL PRODUCTION
+
-
Environmental
Geographical
Political
Social
Religious
Economic
Historical

The Energy Environment Simulator is an excellent teaching tool for introducing students to group problem solving, decision making, and conflict resolution. Using the simulator actively involves the students in developing process thinking skills. The students are realistically confronted with the complex problems of converting finite energy resources to meet seemingly infinite energy demands without seriously disrupting Earth's eco-systems.

The following model is designed to assist the students in methodically thinking through energy and energy related problems. They are encouraged to thoroughly process the problem to long term resolution rather than seeking short term solutions through knob turning and push button wizardry.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Future Energy Problem Solving

The following six-step model was designed for use with magic markers, newsprint, and masking tape.

1. The Problem

   Identify the energy problem, not the energy solution.

2. The Options

   Consider the options available, obtain energy facts, information, and data.

   Examine the trade off.

+	−

3. The Solution

   Select an energy solution.

4. The Energy Action Plan

   Make an energy action plan, include task assignments, identify who does what, when, and how.

5. The Evaluation

   Ask yourselves if the plan is working.

6. Repeat the Process

Let's examine the model at each step. The scene: The clock is on. Five years flash by. The chemical energy pool light flips from green to amber. We now have an energy problem. It's time to make an energy decision.

Step 1. Identify the Problem

Students identify the problem using brief yet complete sentences; e.g., there is a shortage in the chemical energy pool, or we are demanding more chemical energy than we are producing.

Step 2. Consider the Options Available

Obtain facts, information and data, and examine the trade off.

In step two, students brainstorm and list the options available as they see them.

We could:

convert more coal to chemical energy,

reduce automobile usage,

reduce heating and cooling demands by issuing mandatory thermostat settings.

Once the list is complete, they should examine each option in light of their respective rewards and consequences. They should look in terms of economic, environmental, social, political, geographical, religious, and historical trade off. They could ask themselves:

What might happen if we stripmine more coal in Wyoming?

What impact will coal mining have on the ranching communities, the local grocery stores, the schools, the chamber of commerce, the land, air and water quality? What sacrifices will each sector make? What rewards might each receive?

What might happen if we reduce automobile usage? What impact might it have upon the economy of Detroit, the Ford plant worker, the Ford car salesman, the gas station operator, the price of gasoline, or the supplies of gasoline?

To effectively incorporate this section, the students should have access to facts, information, and data on present resource utilization, known reserves, pollution from energy conversion, population growth projections, food production trends, and a concept of exponential growth.

Step 3. The Solution

After examining the trade off, rewards, and consequences of various options, the group collectively selects what they believe is the most appropriate solution to their particular energy problem. This solution is then specifically dealt with in the Energy Action Plan.

Step 4. The Energy Action Plan

The plan is stated in complete sentences and task assignments are made. Students identify what they will do, who will be responsible for issuing energy policy statements, when the plan will be implemented, and how it will be enforced.

Step 5. The Evaluation

Now the group implements their plan and evaluates its impact.

Step 6. Repeat the Process

The whole process is then repeated.

It readily becomes obvious that few students would use the simulator if they had to laboriously follow such a process each and every time an energy shortage light appeared. With that realization, the teacher need only guide the students through the process a couple of times or until some consistent conflict resolution strategy emerges. By guiding the students through a step-by-step problem solving process, the teacher provides a sound methodology for the students to use as a basis for future decision making.

Future Energy Problem Solving

This process is flexible and can be easily adapted to meet the needs of your particular group. Whether the teacher uses this particular model or devises his/her own unique model, it provides a solid foundation by which the students can ask themselves the following questions:

What is the problem?
What are the options available?
What are we doing now?
What could we do differently?
What trade off would be involved?
Is our plan working?

Hopefully such a process will enhance the group's collective energy decision making skills. It should also help prevent the group's use of the simulator from regressing to a random knob twisting tournament or a student popularity contest. On the contrary, the simulator should be used to immerse the students in the realities of the energy problem.

The simulator prompts students early on to recognize the importance of equipping themselves with facts, information, data, and the ability to scrutinize the trade off of energy options. Such a strategy should enhance their commitment for searching out the most appropriate solutions for tomorrow's energy problems. For what are the energy problems of today if not the unforseen or conveniently ignored consequences of yesterday's energy choices.

My Fellow Americans

VOTE
ENERGY

Instructions:

Each participant is to assume the role of a political candidate. Assume you are recording a three minute statement on an energy-related issue. The statement will be used as an advertisement in your political campaign. You are hoping to gain voter support by the statement.

The ideas should be presented in promise form as a program of action you intend to implement when elected. A three minute message should be prepared, rehearsed, and recorded on video tape. Numerous variations of this theme can be used.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

EAC

PRESENTS

Energy: Can't Do Without It

No. 1686 14 min.
I. J. 1974

Instructions:

This film will help the students:

1. Recognize the extent to which energy is needed in our everyday lives.
2. Appreciate the relationship between energy and jobs, energy and leisure.
3. Have an awareness of the limitations of depletable resources.
4. Realize the need to use present sources of energy more efficiently both now and in the future.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

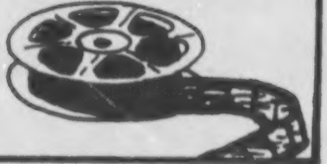
PRESENTS

ENERGY:

LESS IS MORE

No. 1170

18 min.



Instructions:

This film will help the students:

1. Understand society's need to develop ways of using less energy.
2. Understand some of the areas where energy is used prodigally and some of the ways in which large savings can be made.
3. Begin to acquire a new perspective which will help in adjusting conservation measures when enacted, and in developing new habits of energy use.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

EAC

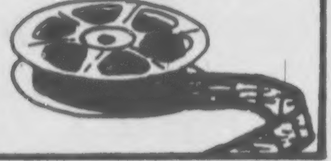
PRESENTS

ENERGY:

NEW SOURCES

No. 1172

20 min.
16 mm.



INSTRUCTIONS:

THIS FILM WILL HELP THE STUDENTS:

1. OBTAIN INFORMATION ON OUR EXPONENTIALLY GROWING USE OF ENERGY.
2. OBTAIN INFORMATION ON THE EXTENT OF THE SUPPLY OF FOSSIL FUELS, HOW LONG THEY WILL LAST AT OUR INCREASING RATE OF USE, AND THE ENVIRONMENTAL COSTS OF EXTRACTING THEM.
3. UNDERSTAND SOME OF THE PROBLEMS ASSOCIATED WITH USING ENERGY FROM ALTERNATIVE SOURCES, PRIMARILY NUCLEAR.
4. UNDERSTAND THAT OUR ENERGY USE IS ON A COLLISION COURSE WITH ENERGY SUPPLY, A CIRCUMSTANCE THAT WILL CHANGE OUR LIVES IN THE NOT TOO DISTANT FUTURE.

NOTES:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

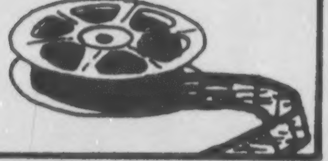
EAC

PRESENTS

Energy, Sources of the Future

No. 1718

15 min.



Instructions:

This film will help the students:

1. Understand that fossil fuels will eventually run out and new resources of energy will have to be developed.

2. Be aware of the damage which can occur if new resources are developed without careful analysis of safety, cost, and effect on the environment.

3. Realize that future energy will be developed by students in school today who will have to work to make what are now dangerous and impractical resources into safe, reasonable, and usable ones.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

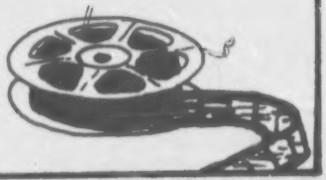
5. How could this activity change the individual's use of energy?

PRESENTS

Energy: The Ultimate Problem

No. 1719

10 min



Instructions:

This film will help the students:

1. See the complexity of the energy problem.
2. Discuss the different viewpoints on energy questions.
3. Understand the value of conservation.
4. See different possible solutions to the energy problem.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

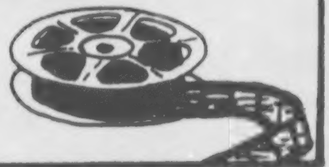
4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

PRESENTS

NUCLEAR POWER AND THE ENVIRONMENT

No. 1454 14 min.



INSTRUCTIONS:

THIS FILM WILL HELP THE STUDENTS:

1. RECOGNIZE THE PROBLEMS THAT STEM FROM THE GROWING DEMANDS FOR ELECTRICITY IN THE UNITED STATES.
2. DISCUSS THE CARE TAKEN IN STUDYING AND CONTROLLING EFFECTS OF NUCLEAR POWER PLANTS ON THE ENVIRONMENT.

NOTES:

Which of the following questions could be answered with this activity?

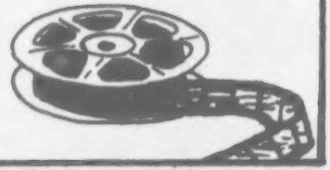
1. What is energy doing?
2. What forms are being converted?
3. What resources are being used?
4. What changes could this activity mean for society?
5. How could this activity change the individual's use of energy?

PRESENTS

Power

No. 1723

19 min.



Instructions:

This film will help the students:

1. Appreciate the need for conservation of electrical energy.
2. Understand the problems of producing electricity from nuclear power.
3. Examine the conflict between the power companies and the environmentalists.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Individual and Energy

Manufacturing Uses Energy

Manufacturing is one of the big energy users. Information on the energy needed to produce goods can create an awareness for possibilities to re-use and re-cycle products.

Energy Expenditure in Manufacture of Various Materials (M Calories per ton)

Material	Energy
Metals	
Steel	6.5
Aluminum	18.8
Lead	7.8
Copper	10.0
Zinc	11.5-13
Cement, Clay, Glass	
Cement	2.5
Glass	
Plate & Bottles	3.5-4.5
Technical Glassware	13.5
Handmade Glassware	20.0
Porcelain & China	10.0
Tile	1.
Bricks	.25-1.5
Plastics	
Polyethylene	34.
Polypropylene	36.
Polyvinylchloride	26.
Polystyrene	11.

Source: Patterns of Energy Consumption in the United States, Office of Science and Technology, Executive Office of the President, Washington, D.C., 1972.

Suggestions:

1. Research available materials.
2. Students can write for information.
3. Display students' illustrations of the various phases in the manufacturing process.
4. Students can bring articles made from the materials for display and investigation.
5. List ways to use this knowledge in buying things to help save energy.

Packaging

1. Introduce packaging by talking about the history of packaging using the poster and the following information:

   A. Early peoples used things that were available to them such as hides, woven twigs, layers of bark and large leaves to carry foods short distances. But these provided little protection.

   B. Since greater protection was needed wooden boxes, barrels, baskets and earthenware jars evolved. What are some of the weaknesses of these kinds of packaging?

   C. In the 1700's, as urban markets grew, paperboard boxes and fiber containers were developed for greater protection of products during transport and storage. However, foods were still subject to contamination by rodents, insects, molds and bacteria.

   D. In the 1800's, the process of canning revolutionized the food industry. Air tight containers--thick glass jars or hand-soldered tin cans--were used. The process of heat sterilization destroyed common food spoilage bacteria. This method of food preservation didn't drastically alter the product's nutrient value, flavor or appearance.

2. Read the display--"Each package must be designed to perform a variety of functions...". Read each function and discuss it.

   A. In the history of packaging which of these functions were handled?

   B. Which were not?

   C. Which do you consider to be the most important functions? Why? Least important functions? Why?

3. Talk about magnetic board display: Explain how fossil fuels are used in making and transporting the different packages.

   A. Three Biggest Energy Users are:

	Manufacturing	Heating and Cooling	Transportation
Use of	natural gas	natural gas	oil
fossil	oil	oil	
fuels	coal	coal	

4. Discuss what materials the different packages are made of. Use as many of the following as you can:

plastics
styrofoam
saran
aluminum
tin
steel
glass
cardboard
paper
cellophane

   A. Make sure that the students know what the different materials are.

   B. Put three categories on the board:

   WOOD ELEMENTS OIL

   and have the students put the names of the materials under the correct category.

   C. Examples of such groupings are:

WOOD	ELEMENTS	OIL
paper	glass	plastics
cellophane	tin	saran
	aluminum	styrofoam
	steel	

   D. Make sure that the students are aware of which materials are made from fossil fuels.

5. Ask the students to think about which of the packaging items would be the most energy efficient to buy:

   A. a styrofoam egg carton or a cardboard egg carton

B. fruits and vegetables packaged in paper sacks or plastic bags

C. a plastic liter bottle or glass bottles

D. Your own examples:

The students should make their decisions according to the information you talked about in #3 and #4.

6. Bring out information about recycling.

A. Glass can be recycled and reused (sterilized).

B. Aluminum and steel can be recycled.

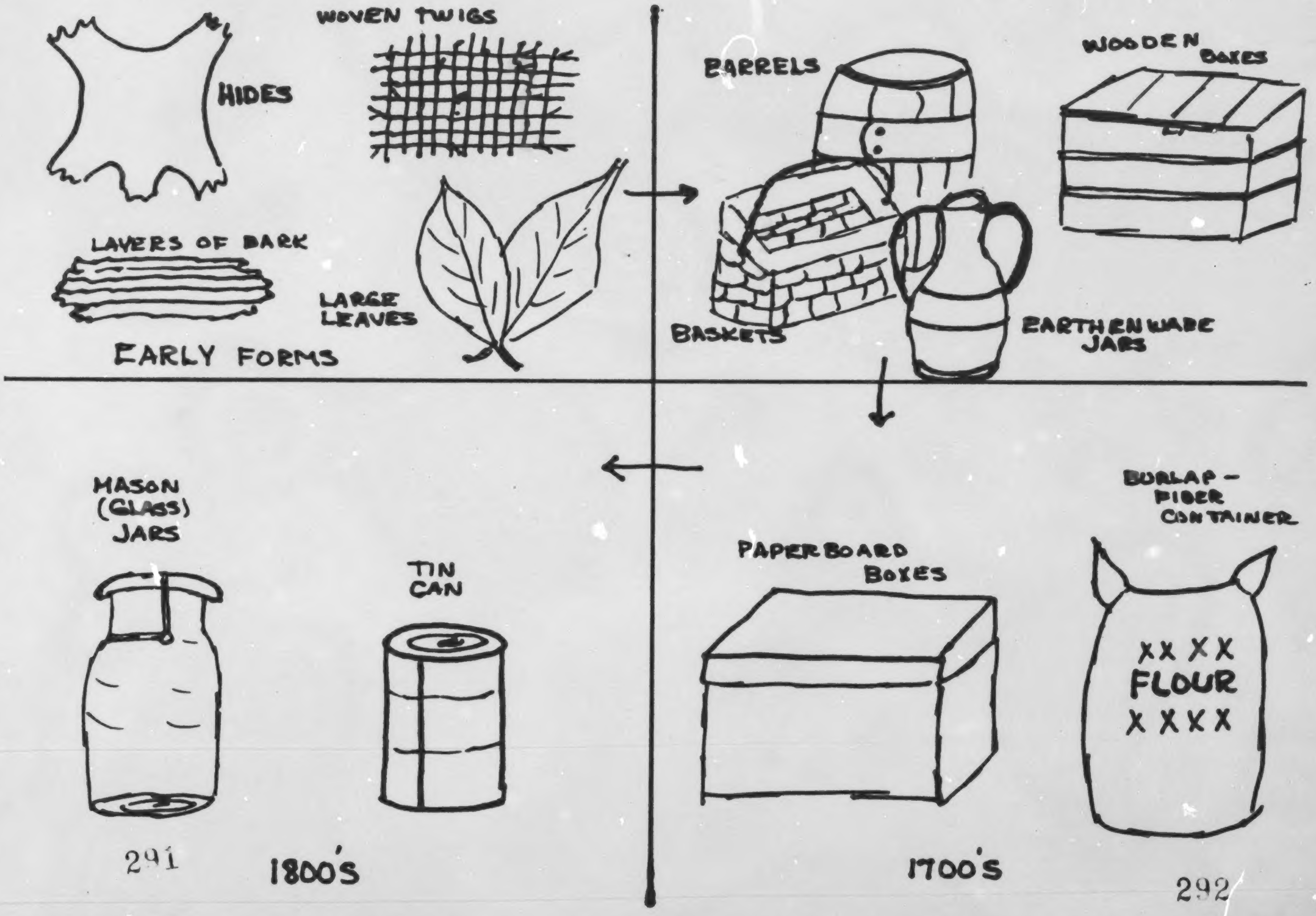
C. Plastics cannot be recycled or reused as easily as the others. But students can come up with ideas about how they could use the items for other things. Examples: storing things at home, toys

7. As future consumers, students can learn how they might go about exercising their rights by telling store owners that they would be interested in seeing them buy items packaged differently. Example: Paper vs. plastic. They might consider returning paper sacks to grocery stores to be used again.

8. Students can also look for examples of over-packaging.

9. STRESS that we are not telling students what to do, but to be aware the options they face in making energy decisions.

HISTORY OF PACKAGI

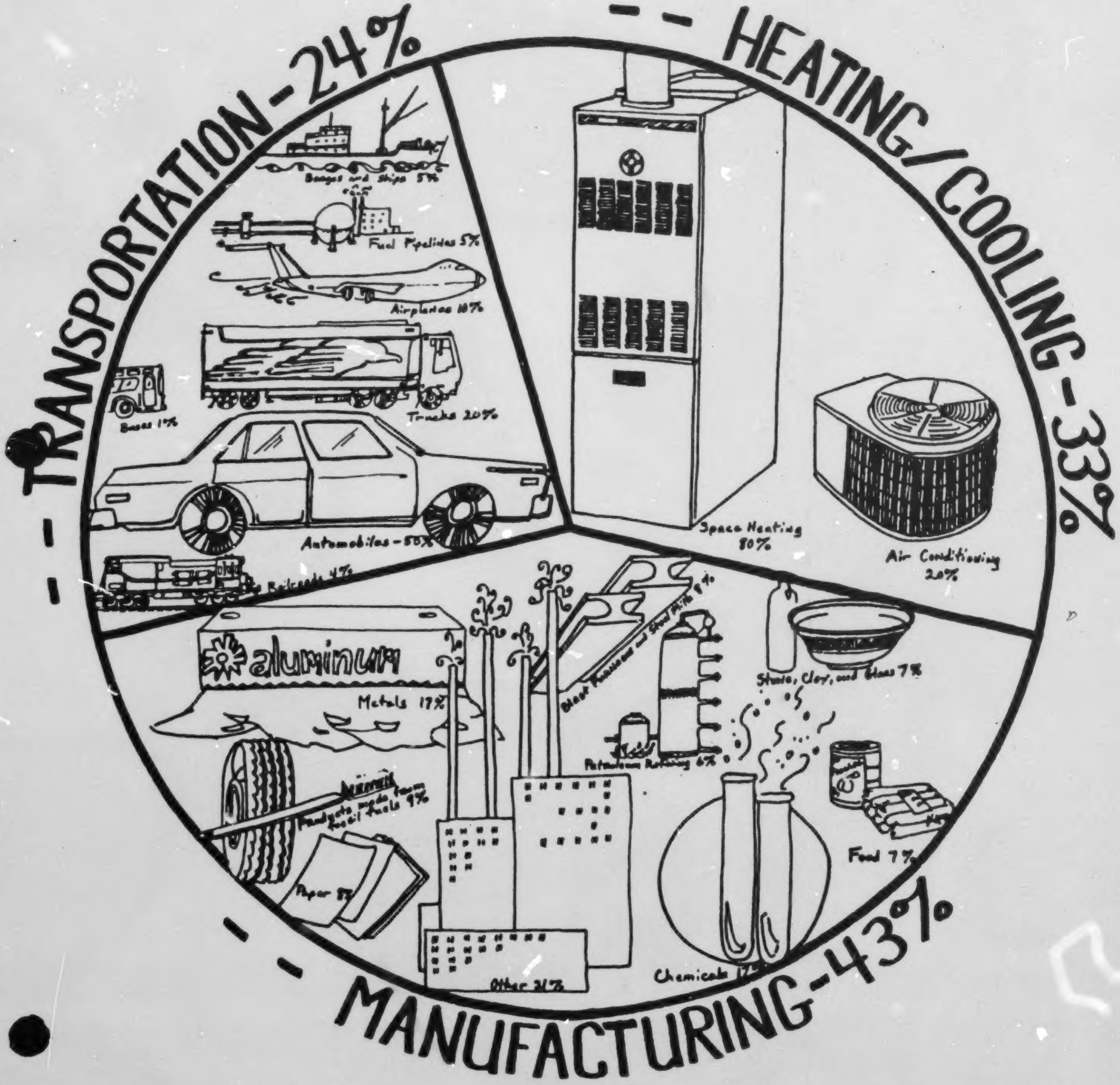

HIDES
WOVEN TWIGS
LAYERS OF BARK
LARGE LEAVES
EARLY FORMS
BARRELS
WOODEN BOXES
BASKETS
EARTHENWARE JARS
MASON (GLASS) JARS
TIN CAN
1800'S
PAPERBOARD BOXES
BURLAP-FIBER CONTAINER
XX XX
FLOUR
XXXX
1700'S

FUNCTIONS OF A PACKAGE

Each package must be designed to perform a variety of functions.

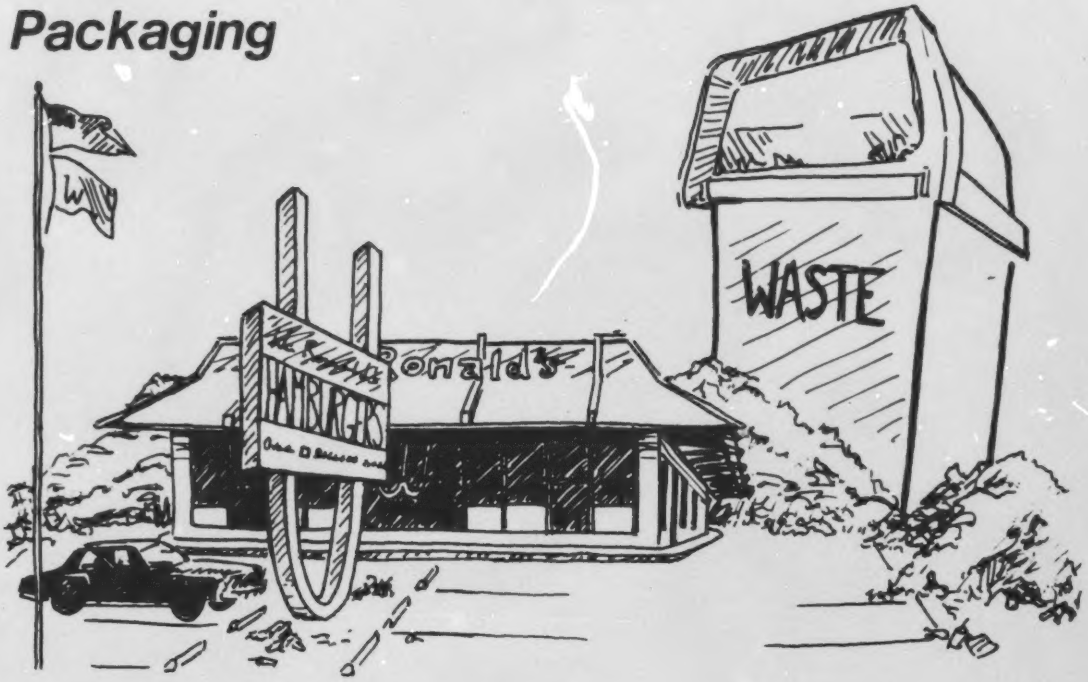
1. To contain the product in amounts conveniently sized and shaped for consumer needs.
2. To protect the product from contamination, spoilage, crushing and breakage.
3. To preserve the nutritive value and quality of the product.
4. To facilitate product storage and preparation.
5. To convey important information about the product.

3 Biggest Users of ENERGY



Source: Energy and Society. Investigations in Decision Making, Biological Sciences Curriculum Study, 1977, pp 62, 63, 64, 65

Packaging



ADDITIONAL INFORMATION

1. Each of us was responsible for 1400 pounds of solid waste in 1979. That amount of trash would fill three garbage trucks (side by side) from New York to California.
2. It cost $6,000,000,000 to collect and dispose of all our trash in 1979.
3. Of all the trash we accumulate, a little more than 1/3 of it is from packaging--bags, bottles, boxes, cans and other containers.

ADDITIONAL IDEAS

McDonalds

Go to McDonald's to find out:

- How many wrappers, paper bags, plastic boxes, etc., they use daily
- Approximate cost of these throw-aways
- Cost of trash hauling
- Number of trees required to make McDonald's throw-away for one day (optional)

At Supermarket

Visit supermarket to:

- List as many throw-away packages as possible
- Check with meat counter "boss" how much wrapping is needed for meat

In School

- Check with custodian how much paper toweling is used daily
- Collect aluminum or styrofoam lunch trays (rinse in a bucket right after lunch)
- Count number of straws used in a day, a week
- Collect "fancy packages" (colorful, inside moldings, unusual shapes, etc.), list forms of energy used
- Collect throw-aways for one week at home
- Bring to school and make a "throw-away" tree

Wichita Eagle

- Visit to see use of energy to run presses
- Number of trees cut daily to supply paper

RESOURCES USED IN PACKAGING

MANUFACTURING

1.

2.

3.

HEATING AND COOLING

1.

2.

3.

TRANSPORTATION

1.

MATERIALS

Saran
tin
styrofoam
cellophane
steel
glass
plastic
aluminum
paper

SOURCES

OIL 1.
3.
3.

WOOD 1.
2.

ELEMENT 1.
2.
3.
4.

NAME: ______________________ DATE: ______________________

Petroleum Palace

Instructions:

You have been invited out for lunch at a very special restaurant. It is called "Petroleum Palace" and its unusual feature is that prices are based on the amount of energy used for each food. The manager charges a great deal for foods requiring much energy to grow and process, and lower prices for food using less energy. (See price list.) A discount of 10¢ is given to each patron who explains why one food is "energy-cheaper" than another.

Pass out the menus. Give students time to make choices. Read the cost per item and explanations provided. Discuss the energy difference between foods in each course of the meal.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Petroleum Palace

Menu

Appetizers: CHOOSE ONE FROM EACH PAIR

* Fresh Juice or Frozen Juice ______

* Cracker A (unwrapped, available to the store in bulk),
OR
Cracker B (wrapped individually, packed in small cartons) ______

* Butter or Margarine ______

Main Dish: PLEASE MAKE A FIRST AND SECOND CHOICE AS WE DO NOT ALWAYS CARRY EACH ENTREE

* Luncheon Meat ______
* Chicken ______
* Turkey ______
* Rice and Vegetables ______
* Beef (Grass-Fed) ______
* Beef (Grain-Fed) ______

Vegetable: SORRY, TODAY WE HAVE ONLY CARROTS, BUT YOU MAY CHOOSE YOUR PREFERRED TYPE

* Fresh Carrots ______
* Dehydrated Carrots ______
* Frozen Carrots ______
* Canned Carrots ______

(over)

Drinks: PLEASE CHOOSE A FIRST AND SECOND CHOICE AS WE SOMETIMES RUN SHORT OF ONE KIND OF DRINK AT LUNCH

* Soft Drink (in aluminum can) ____

* Soft Drink (in returnable glass bottle) ____

* Milk ____

* Juice (bottle) ____

Dessert: CHOOSE ONE

* Apples-Homegrown (in our restaurant's own garden) ____

OR

Store bought ____

* Walnuts - shelled ____

OR

Unshelled ____

* Ice Cream ____

The Energy Menu comes from Food: Where Nutrition, Politics, and Culture Meet, a publication of Center for Science in the Public Interest, 1755 S Street NW, Washington, DC, 20009.

Petroleum Palace

PRICE LIST AND EXPLANATIONS FOR FOOD SOLD AT PETROLEUM PALACE:

(Prices are proportional to actual energy expenditure)

APPETIZERS:

- Fresh Juice: 12¢ Frozen Juice: 46¢
  (Freezing and processing use a great deal of energy, both initially and for storage)
- Cracker A: 10¢ Cracker B: 15¢
  (Food excessively packaged or only available in small packages is more energy-intensive than unwrapped foods or foods available in bulk.)
- Butter: 15¢ Margarine: 5¢

MAIN DISH:

* Luncheon Meat:	$1.60	* Rice and Vegetables:	$ .45
* Chicken:	.96	* Beef (Grass-Fed)	1.48
* Turkey:	1.06	* Beef (Grain-Fed):	2.08

(Animals are inefficient converters of protein. A pound of meat requires about four times the energy to produce and market as a pound of vegetable protein. Some animals are more efficient converters of protein than others.)

VEGETABLE:

* Fresh Carrots:	12¢	* Frozen Carrots:	31¢
* Dehydrated Carrots:	92¢	* Canned Carrots:	23¢

(Processed vegetables require more energy than fresh vegetables; freezing and dehydration especially require large amounts of energy.)

DRINKS:

* Soft Drink (aluminum can): 45¢ * Juice (bottle): 12¢
* Soft Drink (returnable bottle): 31¢ * Milk: 34¢

(Aluminum cans require a great deal of energy to mine and manufacture: non-returnable containers use much more energy than returnable containers which can be reused approximately 15 times.)

DESSERT:

* Homegrown apple: 3¢ * Store-bought apple: 19¢

(Homegrown apple by commercial methods saves commerce and transport; organic methods would save more.)

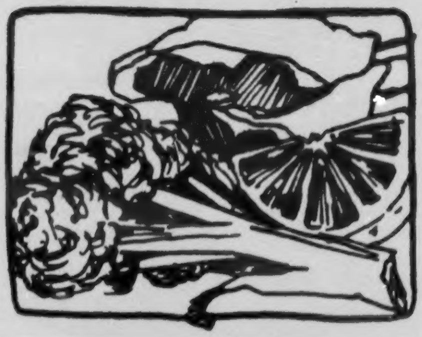
* Walnuts, shelled: $1.04 * Walnuts, unshelled: 39¢

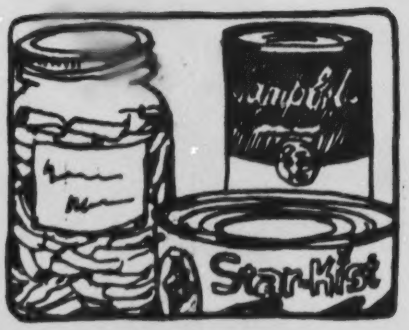
(This is another example of the high cost of processing.)

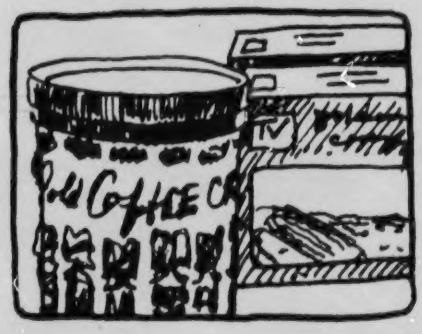
* Ice Cream: 60¢

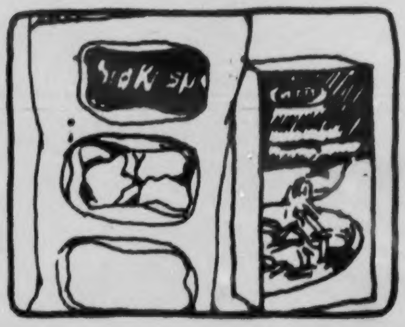
(Large quantities of milk are used; freezing is necessary.)

Food and Energy









Instructions:

Select an assortment of fresh and processed food. Give students an opportunity to explore the boxed, canned, frozen, and fresh foods. Guide the discussion to include an awareness of the amount of energy used in the production of food. Look at energy in the packaging process, the amount of transportation needed, the energy to preserve, and then to prepare the food.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

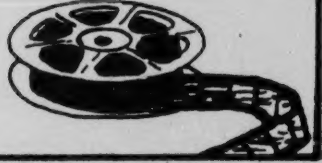
5. How could this activity change the individual's use of energy?

PRESENTS

"TOAST"

No. 1687

12 min.
16 mm.



INSTRUCTIONS:

THIS FILM WILL HELP THE STUDENTS:

1. UNDERSTAND THAT MOST OF THE FOSSIL FUEL ENERGY THAT HAS POWERED OUR CULTURE HAS COME FROM CONCENTRATED AND EASILY OBTAINABLE RESERVES.
2. RECOGNIZE THAT NOW WE MUST DIG DEEPER, TRANSPORT FURTHER, UPGRADE DILUTE ENERGIES TO OBTAIN OUR ENERGY SUPPLY.
3. REALIZE THAT MUCH ENERGY HAS TO BE USED DIRECTLY AND INDIRECTLY TO SUPPORT THE MACHINERY, PEOPLE, SUPPLY SYSTEMS, ETC., WHICH DELIVER THE ENERGY.

NOTES:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

"toast" reflects net energy profit

The true value of energy to society is the NET ENERGY PROFIT, which is that remaining after the energy costs of getting and concentrating that energy are subtracted, much like net money profit.

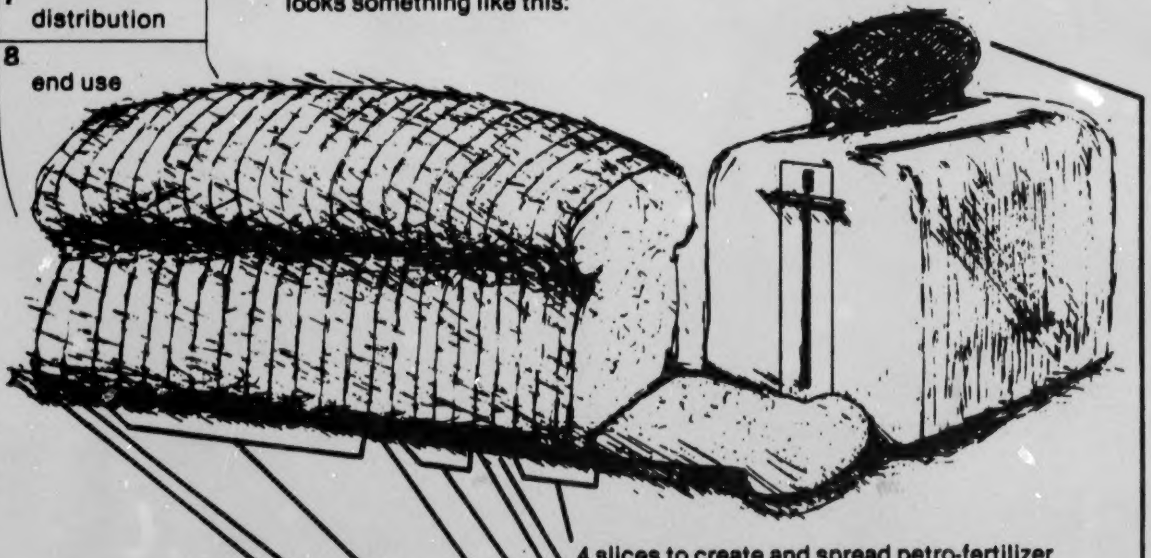
1 exploration
2 extraction
3 transport 1
4 processing
5 transport 2
6 conversion
7 distribution
8 end use

Most of the fossil fuel energy that has powered our culture has come from concentrated and easily obtainable reserves. Now we must dig deeper, transport further, upgrade dilute energies (uranium, oil shale, etc.) to obtain our energy supply. Much energy has to be used directly and indirectly to support the machinery, people, supply systems, etc., to deliver the energy.

If it takes 10 units of energy to bring 10 units of energy to the point of use, then there is no **net energy profit**.

One of modern mankind's most disturbing uses of fossil fuels is the energy used in the preparation and marketing of food, for which we often get no return in food value. The film "toast" traces the production and distribution of a loaf of bread from oil wellhead to end use.

If we let that loaf of bread (most 1 lb. loaves contain 25 slices) represent the amount of fossil fuel necessary to produce it (not counting solar energy) it looks something like this:



4 slices to create and spread petro-fertilizer
1 slice to raise hybrid grain
1 slice to mill grain into flour
4 slices to package the flour and transport it to the bakery
1 slice to bake the bread
11 slices to process, market & package the bread
1 slice to transport it to the store
1 slice to transport the bread home
1 slice to truck burned toast to dump.

25 slices = no net energy profit

Place corresponding stacks of bread slices in front of the group.

Leading Questions:

1. It is said that in more simple cultures one calorie invested in farming produces from 5 to 50 calories of food, and this one calorie is mostly animal or man power. In our society we use from 10 to 20 calories of fossil fuel to produce only one calorie of food. How large would the first slice be if the bread were produced in India?

2. Where could we save the most energy in producing bread?

3. Would these changes alter our quality of life or lower sanitation standards significantly?

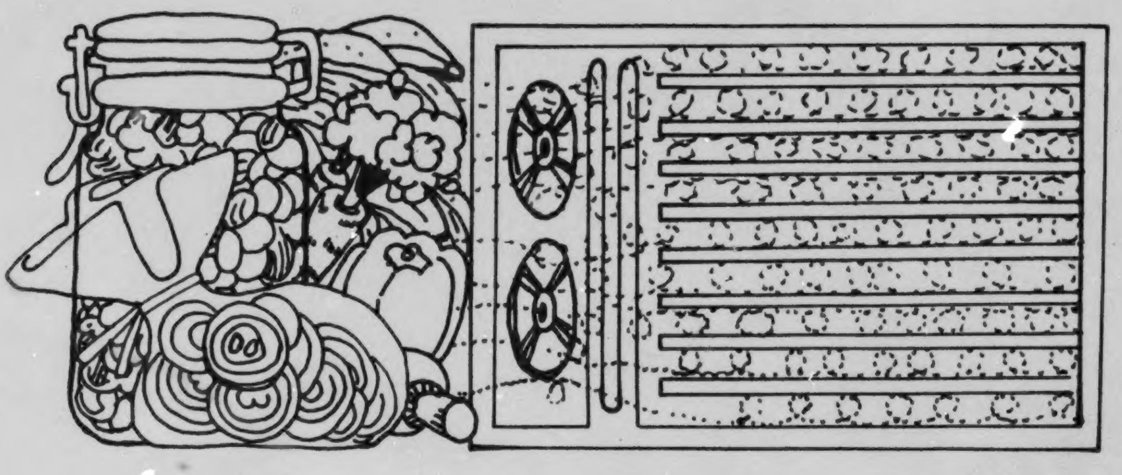
4. How can we instigate these changes in commercial procedures?

5. What other prepared foods do you suspect are high consumers of energy?

6. What portion of the price of bread does the wheat or grain make-up?

Discussion Outline courtesy Energy & Man's Environment, Inc., Portland, Oregon

Drying Food



Instructions:

Before using, check dehydrator over carefully. Any visible damage should be brought to the attention of the staff. To operate unit, turn thermostat knob to desired position. Warmth can be detected in 5 to 10 minutes. Select mature, fully ripe fruits and vegetables- wash carefully. Remove any bad spots, or seeds, and slice into 1/8"- 1/4" thick slices. Place into dryer. To test for dryness, take a sample from the dehydrator and let it cool. Break open and examine broken edges for signs of moisture. Additional drying may be needed. When dried, let cool in dryer and then place into bags and seal. The bags should be labeled as to contents and date. The bags should then be placed into jars or plastic containers which have screw-on or snap-on lids.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

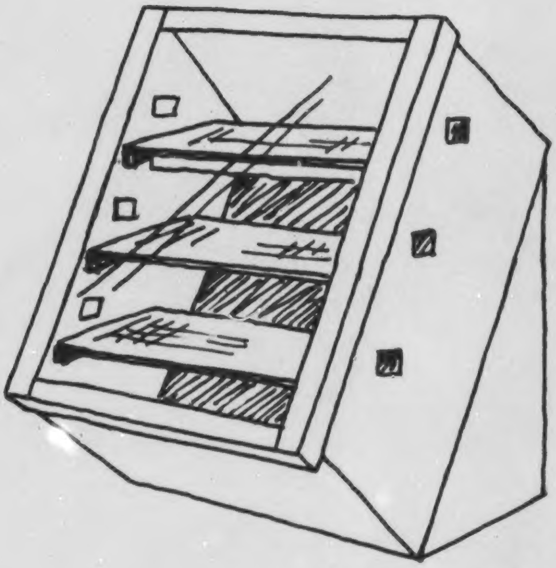
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

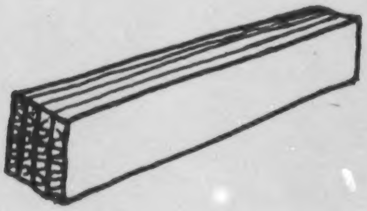
Cardboard Solar Dehydrator



Materials: - 2 cardboard boxes approx. 8" x 14" x 16"
- glue
- masking tape
- saran wrap

---

① SHELF BRACKETS

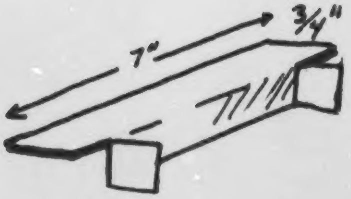


- Cut 24 pieces of cardboard 7" x 3/4". Cut all cardboard parts "along the grain."
- Glue four pieces together lengthwise as shown, thus creating six shelf brackets.

② SHELVES

- Shelf ends

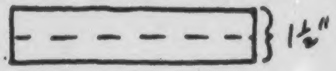
  Cut six pieces of cardboard 7" x 1½". Make a cut through the top layer of cardboard and fold away from cut, as shown. Cut 3/4" slit from each end along the fold. Fold back to form tabs as shown.



- Shelf sides (front and back)

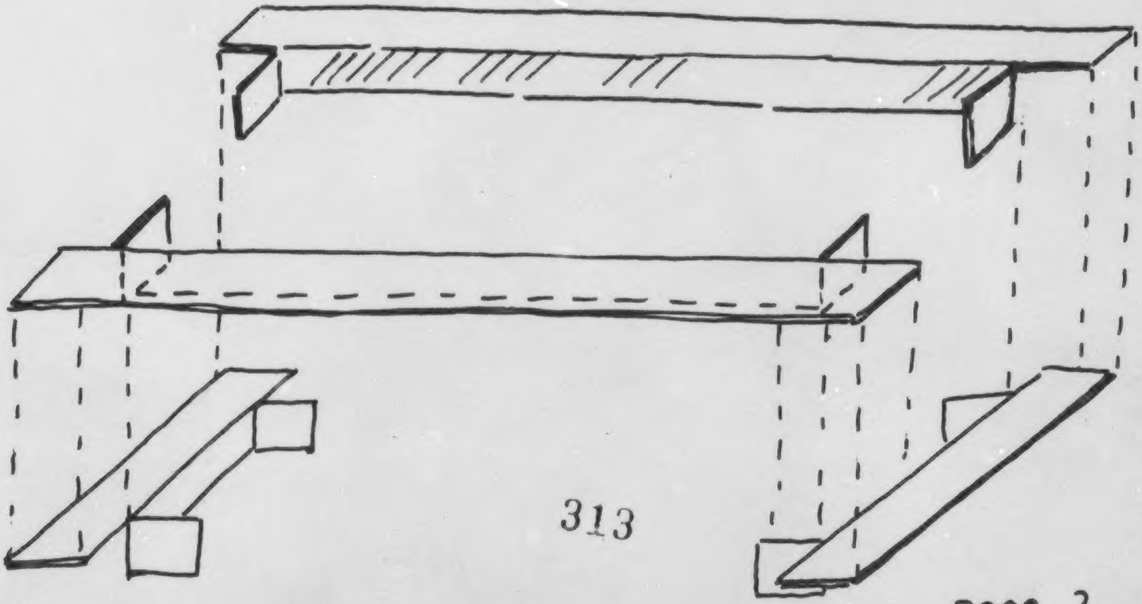
  Cut six pieces of cardboard 1 1/2" wide and 1" shorter in length than inside dimension of box. Cut and fold as in shelf end directions.

(1" shorter than box width)



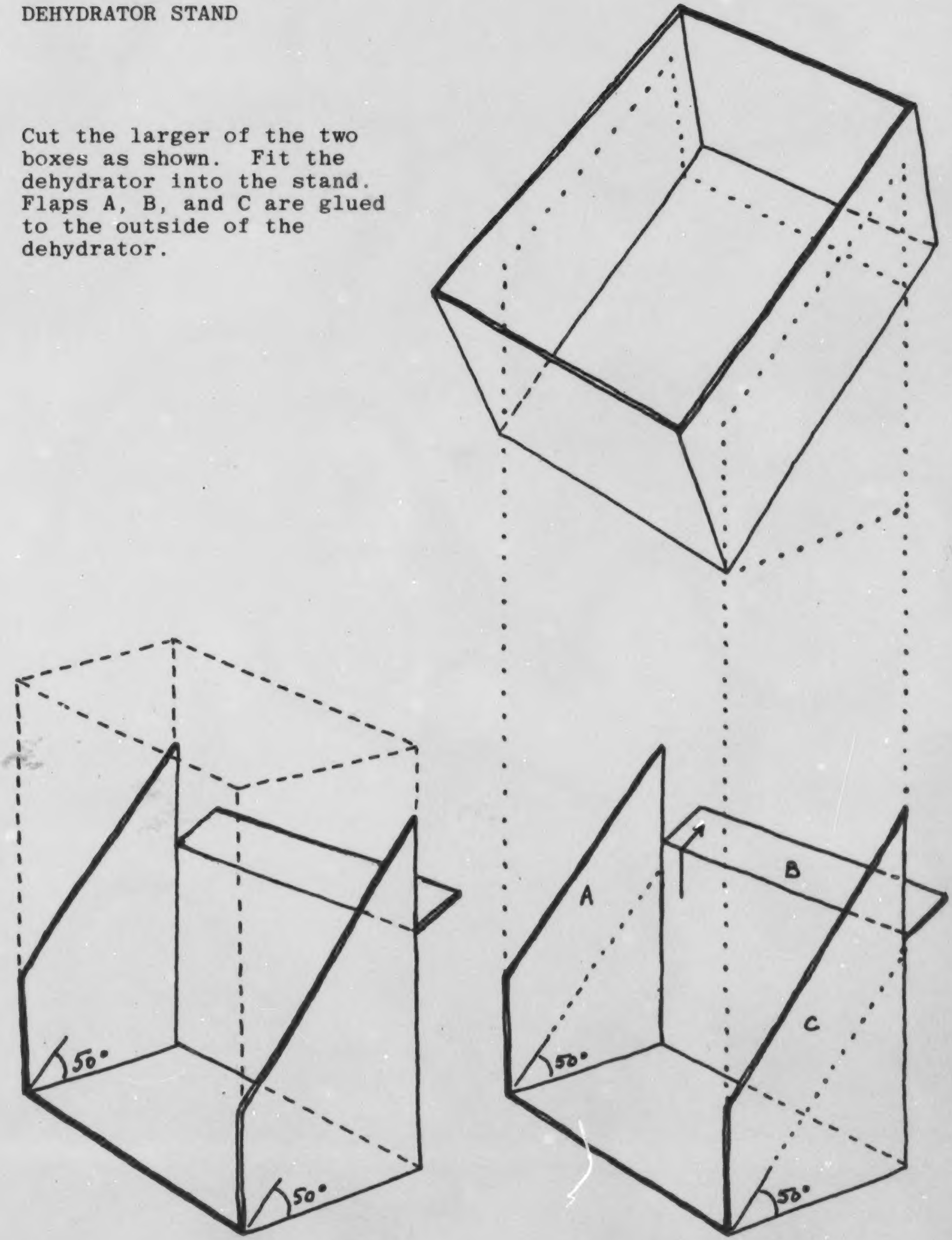
- To assemble shelves, place front and back sides so they overlap end pieces. Staple and/or glue corners and tabs.

- Cut plastic screen 1 1/2" wider and longer than overall dimensions. To attach screens, place shelf flat side down on screen. Fold screen over sides and ends, and staple, keeping screen tight. (Stapling from centers to corners usually works best.) Cut screens in corners as needed.

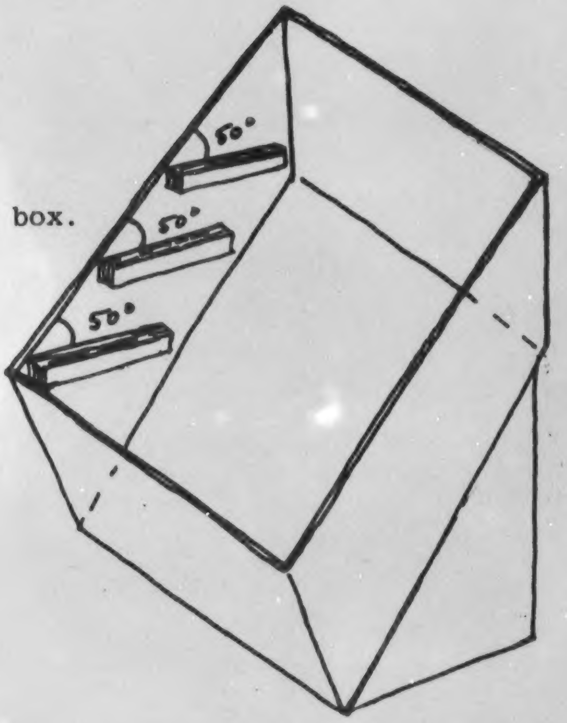


③ DEHYDRATOR STAND

- Cut the larger of the two boxes as shown. Fit the dehydrator into the stand. Flaps A, B, and C are glued to the outside of the dehydrator.



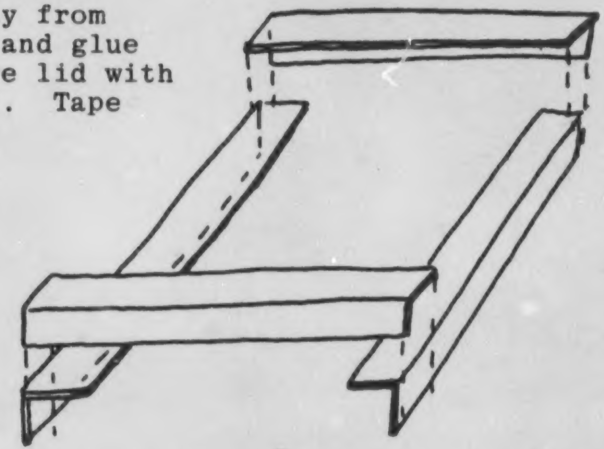
④ DEHYDRATOR



- Cut off flaps of dehydrator box.
- Glue shelf brackets to inside of box.
- Cut ventilating holes in dehydrator equal to about one square inch of hole per shelf on each side. Cut several vents in the bottom and top.
- Glue scraps of screen on the inside to cover vents.

⑤ LID

Cut lid frame from cardboard strips 2" wide and 1/2" longer than the width and length of the box. Score down the middle lengthwise and fold away from the score. Assemble as shown and glue and tape corners. Cover entire lid with plastic wrap stretched tightly. Tape down.



Portable Solar Dehydrator

Instructions:

I. The frame

1. Cut the following from the materials indicated:

   2 sides: 5" x 24" from 5/8" plywood

   1 bottom: 5" x 12 1/4" from 1/2" plywood

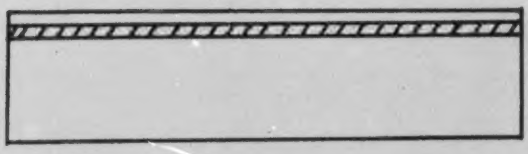
   1 top: 4 1/2" x 12 1/4" from 1/2" plywood

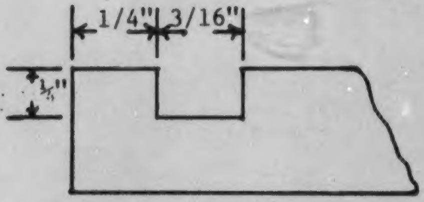
   1 back: 13 1/2" x 24" from 1/8" masonite or similar material

   1 lid: 12 1/2" x 24 1/4" from 1/8" clear plexiglas

   12 shelf rests 5 1/2" long from 1/2" x 3/4" moulding or similar material

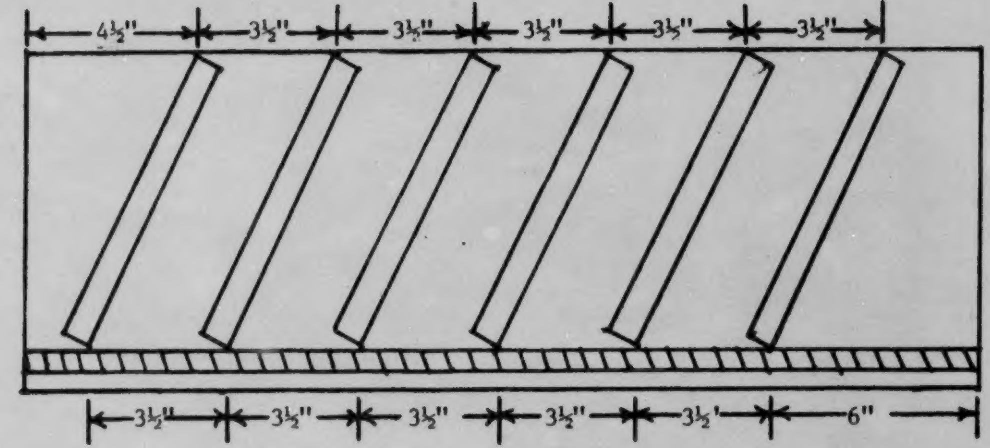
2. Make a groove 3/16" wide and 1/4" deep along the full length of the sides and bottom. The groove should be 1/4" from the edge.

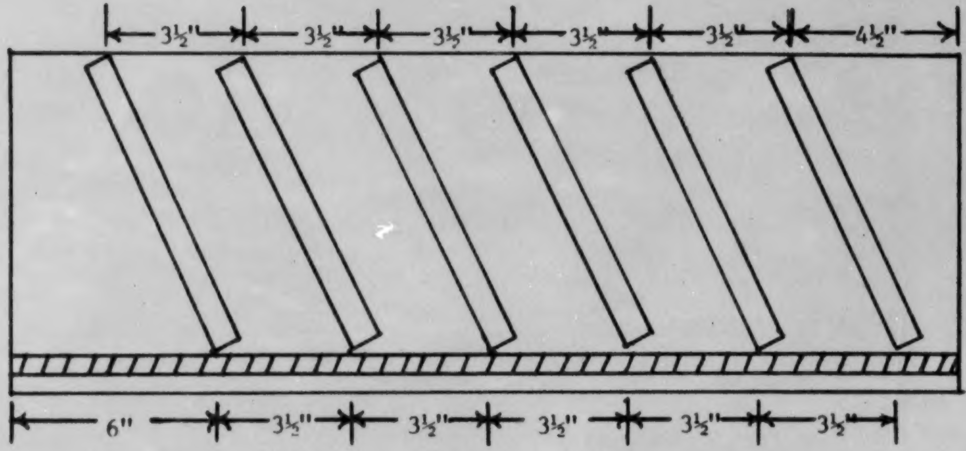




Detail

3. Nail or screw the shelf rests to each side as shown in the diagrams. If this is not done correctly, the proper solar angle will not be obtained. It should be noted that the sides are exact opposites.


4½"
3½"
3½"
3½"
3½"
3½"
3½"
3½"
3½"
3½"
3½"
6"

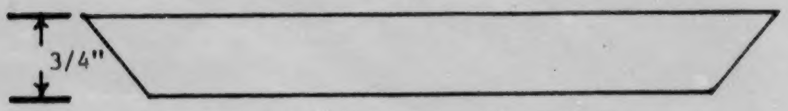

3½"
3½"
3½"
3½"
3½"
4½"
6"
3½"
3½"
3½"
3½"
3½"

4. Drill two or three 3/4" ventilation holes between each shelf rest.
5. Drill ten to twelve 3/4" ventilation holes in the top.

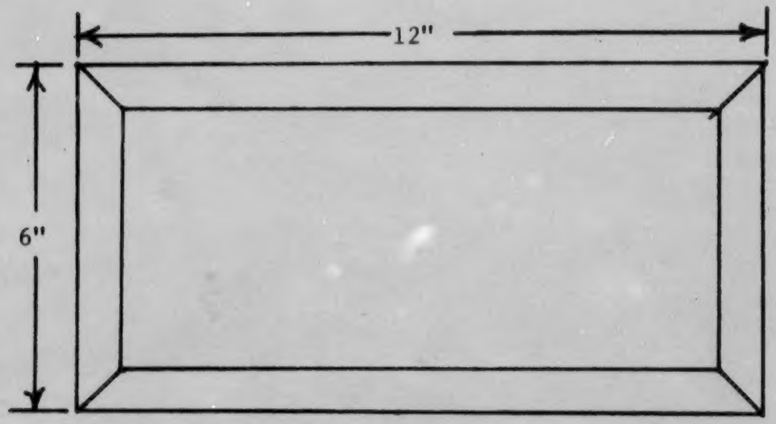
II. The shelves

1. Cut the following from 1/2" x 3/4" moulding:
   12 pieces 12" long
   12 pieces 6" long

2. Miter all corners to 45° as shown.

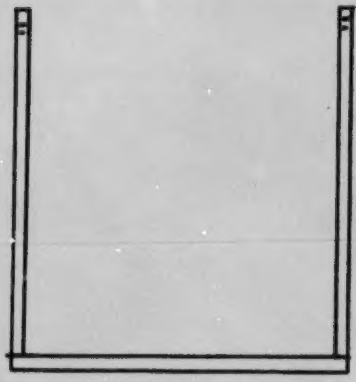


3. Using nails or screws, assemble shelf frames as shown. For additional strength, glue all joints.



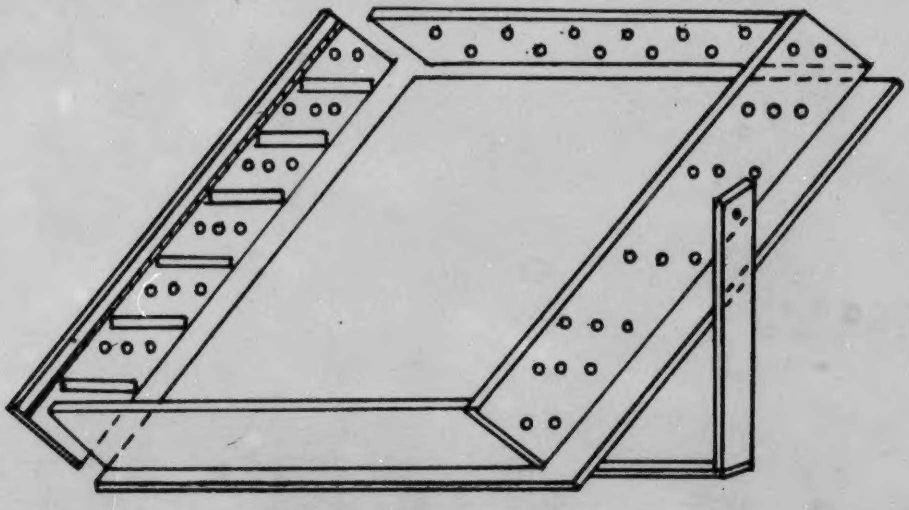
III. The adjustment leg

1. Cut three 1" x 2" pieces 14 1/2" long.
2. Drill a 1/4" hole 1/2" from the end of two of the pieces.
3. Nail or screw the third piece to the other two at the ends opposite the holes.



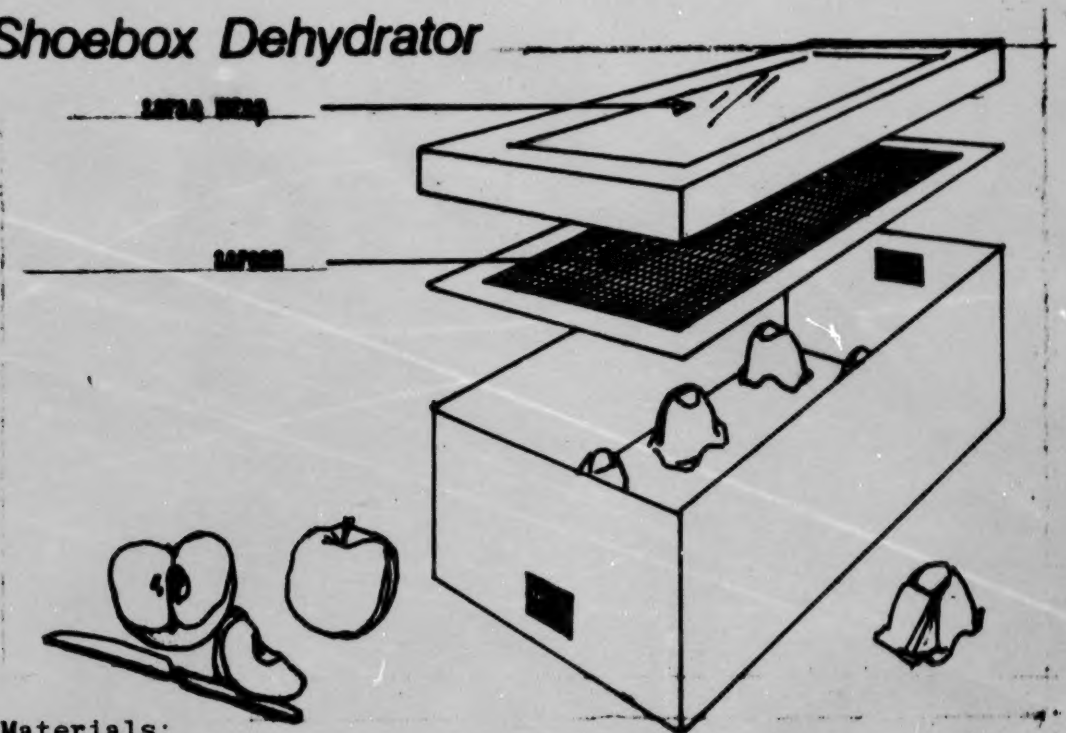
IV. Assembly

1. Nail or screw the sides to the outside ends of the top and bottom so that all back edges are flush.
2. Nail or screw the back to the frame.
3. Drill a 1/4" hole in each side 6" down from the top and 1" in from the back.
4. Attach the adjustment leg to the sides with 1/4" machine bolts.



5. Paint the interior (including the shelf frames) flat black. The exterior may be any color.
6. Attach 12" x 6" pieces of fiberglass screen to the shelf frames with staples.
7. Cover all holes with fiberglass screening on the inside.
8. Place shelves on shelf rests.
9. Slide lid down into grooves from the top. A small cabinet knob attached at the top-center of the lid will facilitate ease of operation.
10. Attach a handle to the top of the dehydrator.

Shoebox Dehydrator



Materials:

Shoebox	Plastic screen
Egg carton	Plastic or Saran Wrap

Instructions:

1. Keep the lid on the shoebox.
2. Draw a small vent (1" X 2") in each end of the box - one near the top, one near the bottom. (Be sure that the lid does not end up covering the vent near the top.)
3. Cut out the vents and cover with scrap screen.
4. Cut six or more egg cups from the egg carton.
5. Turn these cups upside down and glue them into the shoebox - three on a side and three down the middle on wider boxes.
6. Draw a one inch (1") margin around the shoebox lid.
7. Cut out the center carefully and save.
8. Stretch the plastic or Saran Wrap over the open area.
9. Tape the plastic (Saran Wrap) to the lid.
10. Cut the screen to fit the inside of the box and lay the

screen on the egg carton cup supports.

11. Cut the lid center (#7 above) lengthwise into three equal pieces. Fold each piece in half lengthwise (scoring with scissors makes folding easier) and staple to the screen so that it forms a border. Two long ones form the sides. The third is cut in half to form the top and the bottom. This stabilizes the screen.
12. Cut food into thin (1/8" - 1/4") slices and spread on the screen.
13. Place in the sun to dry for several days.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Beef Jerky

Jerkies are nothing more than strips of raw, dehydrated meat that are flavored with a variety of seasonings. It takes about five pounds of fresh meat to make one pound of jerky. It is very concentrated and considering meat prices today, also very expensive particularly when commercially prepared jerky is purchased. As you shop wisely for meats and make your own jerky, the cost can be reduced. Dehydrating meats and jerkies fill the complete protein need in a balanced diet. (Camping menus, in particular, are not always easy to make nutritionally balanced.) Making jerky is a very simple process if the following instructions are carried out.

Preparing Jerky Strips:

Jerkies are usually made from raw meat which is well seasoned. It is then dehydrated and becomes hard and leatherlike.

1. Trim all fat, skin, gristle and bone from the meat. Work with small pieces; 4 x 8 inches is convenient.
2. Freeze the meat to 20-30 degrees F. The meat is solid but can be sliced easily. A meat cutter or serrated blade produces the most uniform slices. Cut 1/8 inch slices across the grain of the meat for a more easily chewed jerky.
3. Season slices with salt and powdered herbs or marinate slices for an hour. See recipe for Jerky Marinade. Drain strips before placing on trays to dry.
4. Dehydrate the strips until hard and leathery, 8-12 hours at about 145°.

Jerky Marinade

3 lbs. lean beef
1 tsp. onion powder
1 tsp. garlic powder
1/2 tsp. pepper
1/3 c. worcestershire sauce
1/4 c. soy sauce
3-4 tbsp. catsup (optional)
1/2 tsp. hickory smoke salt

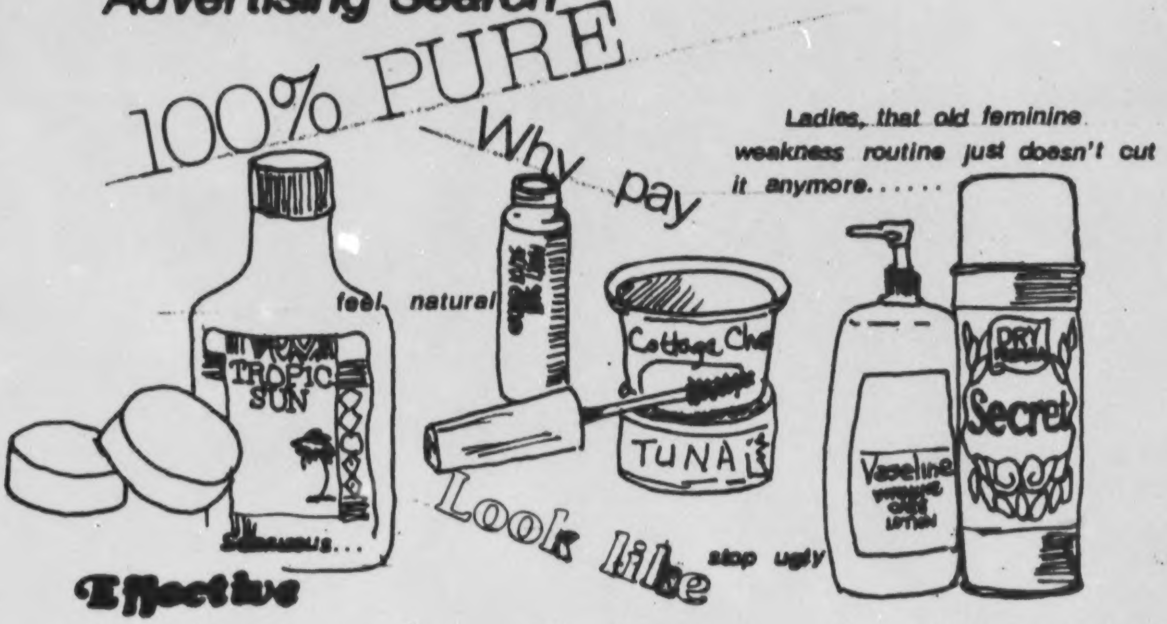
Blend seasonings and pour over meat strips. Cover tightly and refrigerate for at least one hour. Stir or turn pieces during marinating time. Drain strips and load the trays to dehydrate.

Sanitary Working Conditions Are Necessary

First of all, use the cleanest of working conditions.

1. Bread boards should be washed regularly with a detergent and bleach solution (3/4 c. bleach to one gallon of water). Cleaning a board after meats are prepared is essential especially when the meat is fish or poultry.
2. Wash hands thoroughly before and after handling meats. Don't just dry them on a dishtowel and then handle cooked meats or other foods. It is important to avoid recontamination especially if the food will be unrefrigerated for a time.

Advertising Search


100% PURE
Why pay
Ladies, that old feminine weakness routine just doesn't cut it anymore......
feel natural
TROPIC SUN
Cottage Che
TUNA
Vaseline
DRY
Secret
Look like
stop ugly
Sensuous...
Effective

Instructions:

1. Have the students critique various advertisements from magazines, newspapers, and catalogs.
   a. Decide on product being advertised.
   b. List and discuss the various areas of appeal.
      (1) appealing words used
      (2) facial expressions
      (3) scenery
      (4) real vs. fantasy
      (5) theme of ad, and
      (6) what especially appeals to you as a consumer
2. Have the students determine why they buy these products.
3. Discuss with the children the type of energy used to produce these items from the raw material to the finished product. Remember to include the packaging material.
4. Finally make two lists--one "necessities" and one "luxuries". Categorize the various products accordingly and

discuss the results.

a. Why did you choose to classify the item as you did?

b. What has influenced you to feel that this particular product is a necessity/luxury?

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Mod Bods

Instructions:

1. Have the students make a list of what they like to wear.
2. Next, have the students determine why they buy these things.
   a. influenced by advertising
   b. influenced by friends
   c. influenced by style
   d. influenced by weather
   e. influenced by need
   f. other
3. Discuss the types of materials used to make the various articles of clothing.
4. Discuss how energy is used to produce the various items from the raw material to the finished product.
5. Process the exercise by having the students draw conclusions about the relationship between their choice of clothing and the use of energy in making the clothing.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

EAC

PRESENTS

Seeing Through Commercials

No. 1746

15 min.

I. J.

Instructions:

This film will help the students:

1. Isolate and describe production techniques used in commercials for candies, cereals, and toys (i.e., camera angles, close-ups, sound effects, lighting, music, associations of fun and excitement, narration, and disclosure statements).
2. Discuss the nutrition claims made and implied in breakfast cereal ads.
3. Separate the entertainment aspect of a commercial from its promotional purpose.
4. Critically view the commercials they see on their own TV's.
5. Make purchase decisions based on product quality rather than advertising or promotional tricks.
6. Apply the lessons learned to other types of advertising.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Seeing Through Commercials - No. 1746

Seeing through commercials alerts children to the techniques and motivations behind the television commercials they see on Saturday morning and after-school television.

Before the Film

What is a TV commercial?

Why are they on TV?

Do commercials tell the truth about the things they advertise?

After the Film

To the teacher . . . .

The film includes a final commercial with which the children can put to use the analytical skills they have learned. Included below are some of the points that should be brought up about this final commercial.

What tricks did you find in the last commercial (for Jim and Judy's River Raft Set)?

Possible answers: close-up shots - exciting music - sound effects (dog barking, car engine) - car moving without revealing child's hand behind - final disclosure statement notes, "Jim and Judy and Jeep sold separately" - riverside surroundings not available to most children.

Did you ever buy a toy or food that you saw advertised, and then find out it wasn't as good as it seemed on TV? What happened? Why was the "free giggle moustache" included in the package of cereal? What does "artificial fruit flavors" mean?

How might you be tricked by some of these phrases?:

Sugar Fruit Giggles is part of your nutritious breakfast.

Sugar Fruit Giggles is energy food.

Milk adds substantial nutrition.

Some assembly required.

cont.

You can help Ranger Ralph capture the grizzly bear.

Class Projects

When you watch TV after school or on Saturday morning, write down all the tricks you see used in commercials. See if you can find new ones not in the movie.

Divide the class into groups to write their own commercials for toys or foods. Ask the children questions such as:

How can you make the product look better?
What can the narrator say to make people want to buy it?
What sounds can be added?
How should the people in the commercial act?
Overall, what do you want your audience to believe about the product?

A Commercial Probe

Sugar Crunch

Instructions:

Four out of five teachers surveyed recommend this neat, sweet, hard to beat activity for classroom/EAC/home use. It has received the good housekeeping seal of approval and has a surprise (reward) inside -- children gain an understanding of the amount of energy needed to produce a commercial. This activity is part of a healthy and nutritious energy program.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Review A Commercial

1. What product is the commercial advertising?

2. Suggested questions to use before viewing the tape:

   a. What is a television commercial?
   b. Why are they on television?
   c. Is there a lot of energy used in making a commercial? If so, explain the ways.
   d. Is there a lot of energy used in the producing (manufacturing) of a certain product being advertised in a commercial.
   e. Is there a lot of energy used in the moving (transporting from the factory to the store) of a certain product being advertised in a commercial?

3. Techniques used in the commercial:

   - ☐ camera angles, i.e., close-ups
   - ☐ sound effects
   - ☐ association of fun and excitement
   - ☐ number of times commercial was used in the two-hour period (same or different versions)
   - ☐ people used in commercials, i.e., children, children and adults
   - ☐ verbal narration (talking) vs. written information (on the screen)
   - ☐ music, i.e., catchy tunes
   - ☐ lighting
   - ☐ gimmicks used, prizes offered, i.e., cereal
   - ☐ length of commercials (minutes, seconds)
   - ☐ real people vs. cartoon use
   - ☐ environment (surroundings) real vs. imaginary
   - ☐ your own ideas

4. Added notes: ______________________________________

____

____

Teacher Format

1. Decide what product the advertisement is trying to promote.
2. Suggested questions to use before viewing the tape:
    a. What is a television commercial?
    b. Why are they on television?
    c. Is there a lot of energy used in making a commercial? If so, explain the ways.
    d. Is there a lot of energy used in the producing (manufacturing) of a certain product being advertised in a commercial?
    e. Is there a lot of energy used in the moving (transporting from the factory to the store) of a certain product being advertised in a commercial?
3. Techniques used in the commercial:

☐ camera angles, i.e., close-ups

☐ sound effects

☐ association of fun and excitement

☐ number of times commercial was used in the two-hour period (same or different versions)

☐ people used in commercials, i.e., children, children and adults

☐ verbal narration (talking) vs. written information (on the screen)

☐ music, i.e., catchy tunes

☐ lighting

☐ gimmicks used, prizes offered, i.e., cereal

☐ length of commercials (minutes, seconds)

☐ real people vs. cartoon use

☐ environment (surroundings) real vs. imaginary

☐ your own ideas

Extensions:

1. Go to a local grocery or department store and ask for permission to see their purchasing/selling data (statistics) on the products which were advertised on the tape. See if

they were bought more often than those that weren't--brand name. Question: What influence do you think commercials have in the selling/purchasing of a particular product?

2. Use the suggested format while watching television at home on Saturdays or after school and write down your observations. List any new techniques that you might discover which aren't already listed.

3. Divide the class into groups to write their own commercials for toys, games, foods, household products, beauty products, etc. Ask the students questions such as:

    a. How can you make the product look better?
    b. What can the narrator (speaker) say to make people want to buy it?
    c. What sounds can be added?
    d. How should the people in the commercial act?
    e. Overall, what do you want your audience to believe about the product?

4. Develop a commercial which sells one of the following:

    a. some form of energy
    b. some resource of energy
    c. some conservation technique or application in one of the three energy-using areas--transportation, heating/cooling, and manufacturing.

5. Develop a skit or role-playing activity which promotes some aspect of energy

6. Develop a commercial pertaining to some nutritive food--vegetables, fruits, meats, breads, etc.--comparing processed foods to non-processed.

7. Suggested films:

SIX BILLION DOLLAR SELL	#1786
SEEING THROUGH COMMERCIALS	#1746

8. Suggested book:

    The Best Thing on T.V. by Jonathan Price, copyright 1978, Penguin Books, 625 Madison Avenue, N.Y.,N.Y. 10022

A Commercial Probe

Objectives: Students will analyze why they bought something that they had seen advertised recently.

Students will become aware of what techniques advertisers use to try to sell their products to the general public.

Students will critique one or more commercials from Saturday morning cartoon programs to ascertain what techniques have been used in each.

Students will analyze how energy is used in producing the product that is being advertised.

Students will analyze how energy is used in making a commercial.

Equipment and Materials Needed: Videotape machine, videotapes on commercials #1 and/or #2, commercial critique forms, pencils, magnetized sentence strips with advertising techniques written on them. (These match the techniques written on the critique form.)

I. Introduction

A. Ask the students to share with you some information about something they had purchased recently because they had seen it advertised on TV, or in a newspaper or magazine.

1. What was there in the advertisement that made you want to buy the product?
2. How did you feel about the product after you had used it for awhile?

B. Say to the Students - "Advertisers study people so that they know how to motivate people to buy and to want." We are going to talk about some of the techniques advertisers use to influence people to want to buy things.

II. Presentation of the lesson

A. Ask the students to watch a selected commercial on the videotape machine. For the lessons that have been presented at the Energy Adventure Center we have used a tape titled Commercials #1. The commercial we use is for the Hungry Hippo Game. If the recorder is set at zero on the counter the advertisement comes at the 17/18 point on the counter.

B. After the students have viewed the commercial, ask them to share with the class what they liked about the commercial. What caught their interest? Ask if any of the students have the game at home. Is it as much fun to use as you thought it would be?

C. Use the magnetic sentence strips with the following techniques written on them.

1. Camera angles
2. Sound effects
3. Association--fun and excitement
4. People used in commercials--children, adults, both
5. Verbal vs written information
6. Music--catchy tune, jingle
7. Environment--real vs imaginary

Discuss with the students how each of these techniques was used in the Hungry Hippo commercial. You may want to repeat the showing of the commercial so that the students can better visualize them.

D. Use the remaining techniques on the magnetic sentence strips and give examples of commercials that utilize them. They are:

1. Famous people
2. Cute animals
3. Gimmicks used--prizes offered
4. Animation
5. Claims and promises

E. Use the Commercial Critique Forms to ascertain what techniques are used in various commercials on the tape. If you don't have time to preview the tape, it is suggested that you use the following commercials. Each title includes the number you'll see on the counter to indicate their placement on the tape.

1. Wacky Water Writer	29/30
2. Starwars Figures	32
3. Burger King	37/38

You may wish to do the critique form as a total group project or you may wish to have the students do the critique form individually and then discuss their findings as a total group. There are as many ways of presenting the exercise as there are presenters.

F. If you have chosen one of the mentioned commercials, you can tie energy usage into a product the commercial is promoting. The Starwars commercial advertises plastic Starwars figures.

1. Ask the students to consider how energy is used in the Starwars figure itself. (The figure is made out of plastic which is a petroleum derivative.)
2. Ask the students to consider in what other ways energy is used by the Starwars figure. (The figure has to be made by machines that are powered by fossil fuels. They are transported to the warehouse, to the store, to homes by trucks and automobiles powered by fossil fuels. They are kept in buildings heated and cooled by fossil fuels.) You and your students can no doubt think of other ways.
3. After you have talked about how energy is used, challenge your students to think of ways they could make a similar toy by using materials they already have at home. Have them describe how they would create the toy.

G. It also takes energy to make commercials. Consider the many ways commercials use energy. Some ways might be:

1. Electricity to power cameras
2. Lighting
3. Film made out of plastic
4. Processing of film
5. Transporting of actors to and from filming

H. Presentation of additional materials with thoughts for discussion.

Additional Thoughts for Discussion

1. Everyone should realize that when he goes to the store and buys a soft drink in a can, a leather belt, or a pair of sneakers, he's using up resources. He should ask not only if he can afford it, but also whether the Earth can pay the price.
2. More money goes into the production of some 30 second spots than goes into half-hour shows.
3. For one foot of film we see, one hundred feet of film has been shot.
4. Every second of a commercial costs $2,000.

Questions to Consider Before You Buy Something

1. Do I really need it to be happy?
2. What could be used as an alternative or substitute?
3. Will buying it promote a more materialistic lifestyle?
4. Is it inexpensive, yet efficient, in terms of total cost?
5. How long will it last?
6. Can it be recycled?
7. What resources are in it?
8. Are the energy resources scarce (nonrenewable)?
9. From what countries do the resources come?
10. Are there other resources which could be used to make it?
11. Did its production result in significant environmental or ecological damage?
12. Will its use result in significant environmental or ecological damage?

Commercial Critique Form

_____ Camera angles - close ups

_____ Sound effects

_____ Association of fun and excitement

_____ People used in commercials - adults, children, both

_____ Famous people

_____ Cute animals

_____ Verbal vs written information

_____ Music - catchy tunes, jingle

_____ Gimmicks used, prizes offered

_____ Animation

_____ Environment - real vs imaginary

_____ Claims and promises

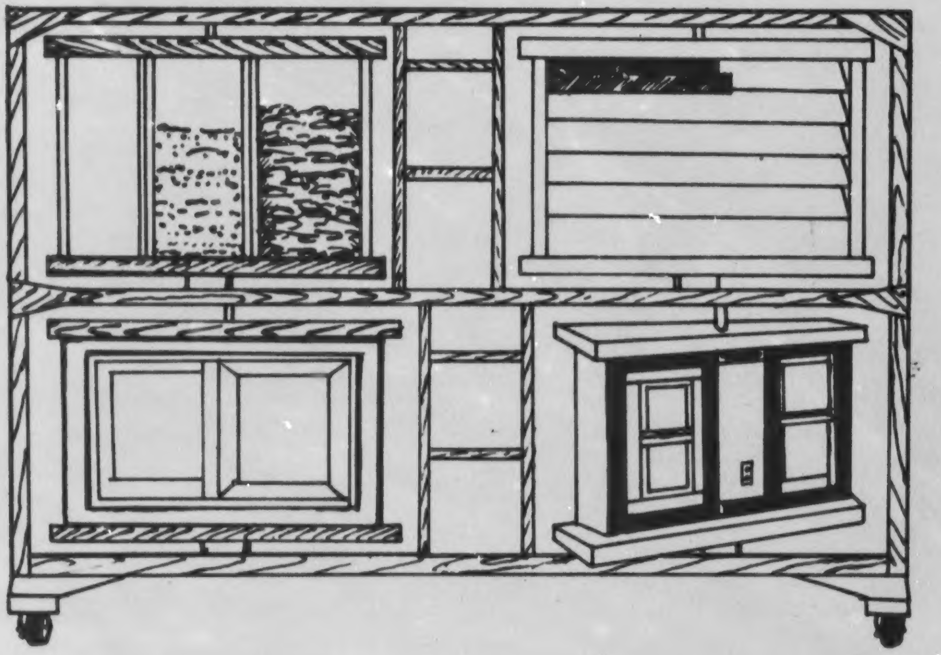
THOUGHTS ON ADVERTISING AND COMMERCIALS

1. Everyone should realize that when he goes to the store and buys a doft drink in a can, a leather belt, or a pair of sneakers, he's using up resources. He should ask not only if he can afford it, but also whether the Earth can pay the price as well.

2. Advertisers study people so that they know how to motivate people to buy and to want.

3. Interesting statistics about commercials:
    - a. Every second of a commercial costs $2,000.
    - b. For one foot of film we see, one hundred feet of film has been shot.
    - c. More money goes into the production of some 30 second spots than goes into half hour shows.

Insulation Display



Instructions:

The insulation display is designed to teach the students about various kinds of insulation, good and poor features of windows, and several other aspects of home insulation. This is accomplished through samples of several kinds of insulation (fiberglass, cellulose, etc.), actual window models, and a "hand-on" demonstration of stapling in batts of insulation and chaulking bad seams and cracks in a model wall section.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Insulation

Introduction:

- Review three major energy use areas (transportation, manufacturing, and heating - cooling).
- Kids can't do much in manufacturing. Name several things for transportation (walking, car pooling, mass transportation, stay at home).
- Kids can do things in heating and cooling.
- Seven things they can do. (Appoint seven to be especially responsible for each.)

1. Wear several layers of clothes.
   a. Two sweaters are worth 5° lower setting.

2. Close the door.
   a. Illustrate - with open school doors in winter.
   b. Illustrate - open doors at K-Mart, etc.

3. Check door weather stripping.
   a. Most people don't know they have a hole in their house. A crack, as thick as a quarter, around a door is equal to about 15 square inches. (Proceed to show several types of weather stripping.)
   b. Use mini-doors to show various types of weather stripping.
   c. More doors mean a larger hole in their house.
   d. Usually largest crack is under front door. (Some kids put rugs or rags to keep out cold.)

4. Install gaskets.
   a. Check draft coming from switches and receptacles. (Show receptacle and switch plate gaskets.)
   b. Be sure to install on outside walls first, walls that have the windows. That is where most cold air comes in.
   c. Illustrate use of foam gaskets.
   d. Go over safety sheet procedure carefully using display.

5. Take short showers.
   a. Illustrate how to install water saver in shower head.
   b. Long showers and tub baths use lots of hot water--energy wasters.

6. Ask parents about home insulation.
    a. Explain "R" value (3½" = R-11   6" = R-19 fiberglass). Most cellulose is higher in R value than fiberglass (about 3.8 per inch vs 3.2 in fiberglass). Rock wool is about the same as cellulose: it's made from slag left over from iron ore.
    b. Insulation for Wichita should be 19-18-38--19 in floors, 18 in walls, and 38 in ceilings.

7. Caulk outside of house.
    a. Review energy savers #1-6. Caulking is like zipping up a jacket, final touch to keep out weather.
    b. Kids can check home and remind parents to do some caulking.
    c. Let students caulk about one board each.

. Review all seven things they can do.

EASY WAYS TO SAVE ENERGY IN YOUR HOME

Weatherstrip any outside doors.

Caulk around windows, door frames, and cracks.

Install storm windows and doors.

Transform balcony into a greenhouse.

Clean heater outlets and return air inlets often.

Open shades and curtains to let in the warmth of the winter sun; close them when the sun goes down or doesn't shine.

Set your furnace thermostat as low as possible for your comfort, then leave it alone for everyday use. When no one is home during the day, or if occupants work, turn the thermostat back at least to 55°F (the same is true if you take a winter vacation or leave for a weekend.

Reduce heat at night by turning down the thermostat about 8° or so.

Keep heat outlets free of furniture and other obstructions. Place furniture used for sitting away from cold windows or chilly outside walls.

Cooling systems should be checked and serviced at the beginning of each cooling season. Clean filters and fans and set motors properly.

Set summer thermostat no higher than 78°. Keep all doors and windows closed.

Use natural cooling as much as possible. Keep windows open in the early morning and evening hours.

Make optimum use of drapes and pull-down shades, they can reduce heat gain through windows by as much as 50% by keeping hot sunlight out.

If you use electric furnace heating, consider a heat pump system.

Heating and cooling can consume 50-70% of all energy used in the home.

When you are not using your fireplace, keep damper and glass doors closed.

Make sure your furnace is not oversized.

Summertime temperature in an attic can soar up to 180° or more. Attic vents are essential to reduce the heat coming down in the living space.

Close off unoccupied rooms.

Don't turn the heat on until you have to. Instead wear heavier clothing and use an extra blanket.

Dust or vacuum radiator surfaces frequently.

Turn off the furnace pilot light in the summer.

Consider the advantages of a clock thermostat for your heating system.

Don't use your fireplace for supplemental heating when your furnace is on.

If you have oil heat, check to see if the firing rate is correct.

Don't let cold air seep into your home through the attic access door.

Use lights only when you need them. Light the place of task, not complete room or house. Buy lower wattage bulbs. Remember: Wattage rating only tells you how much electricity it takes to make the bulb work. Brightness is measured in lumens - so compare lumens and buy the maximum light for your dollar. Long life bulbs may not be the best buy because they use more energy for light given off.

Consider using fluorescent lights whenever you can; they give out 4 times more lumens per watt.

Clean and replace filters on furnaces, rangehoods and exhaust fans.

Remember: Close the door!
Turn out the light!
Do not turn on the shower full blast!
When no one is using them, turn off the TV and stereo (if you have one)!

Insulation should be checked or added to obtain the proper R factor. R factor of 19 for walls and floors in Wichita and R factor of 30 for attic in Wichita.

Use kitchen, bath and other ventilating fans sparingly.

Be sure to check on Federal Income Tax breaks available for investing in certain home energy conservation measures. These measures include insulation, storm windows and doors, caulking and weatherstripping, modifying existing furnaces to improve efficiency, and the use of clock thermostats.

Homeowners and business people who buy solar hot water heaters, space heating and cooling equipment, wind energy, or geothermal energy systems are entitled to a tax credit.

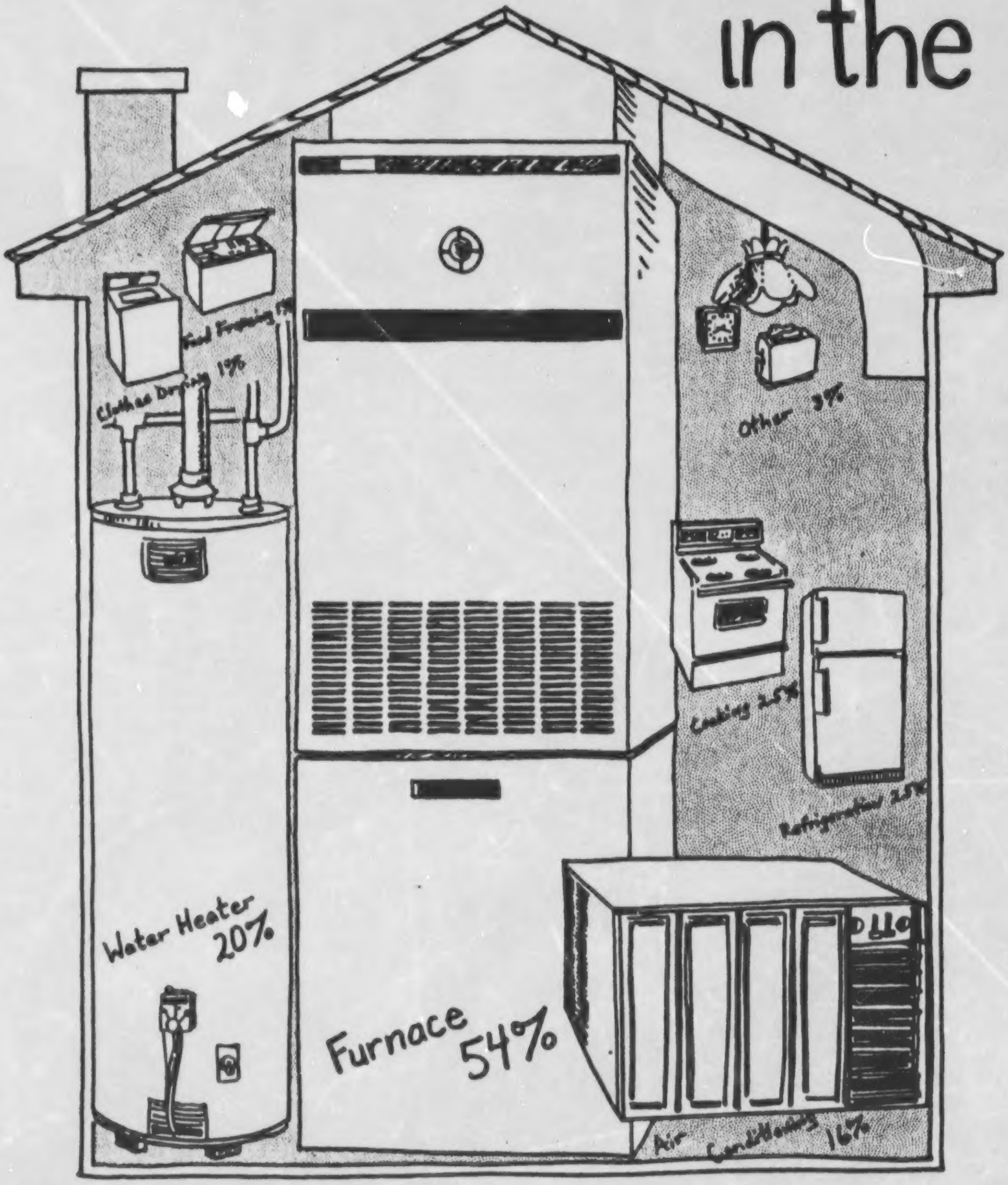
Reduce your use of hot water. Take short showers rather than baths. Install showerhead flow restrictors, use warm or cold water as much as possible for washing/rinsing clothes and dishes.

The hot water system in your home can be a major energy-waster. You can wrap the heater and exposed hot water lines with insulation, lower the heater thermostat setting, have the heater serviced by a qualified person, repair all leaky faucets as quickly as possible.

Most water heaters are set for 140°F or higher. A setting of 120°F can provide adequate hot water for most families. Reducing from 140° to 120° could save over 18% of the energy you use at the higher setting.

Don't let sediment build up in the bottom of your hot water heater, it lowers the heater's efficiency and wastes energy.

ENERGY Users in the


Food Freezing 1%
Clothes Drying 1%
Other 3%
Cooking 2.5%
Refrigeration 2.5%
Water Heater 20%
Furnace 54%
Air Conditioning 16%

HOME

Source: *Energy and Society: Investigations in Decision Making*, Biological Sciences Curriculum Study, 1977, p. 63, and

Final Reports of Task Force Groups, Wichita Energy Commission, December 13, 1979, p. 9

Insulation Display

Objectives: Students will review the seven forms of energy.

Students will become aware that heating and cooling our homes requires the use of a great deal of energy.

Students will become aware of how they themselves can help conserve energy used for heating and cooling.

Students will become aware of what people can do to insulate their homes.

Materials needed: The Insulation Demonstration Display and the Outlet Insulation Demonstration Panel.

I. Introduction

A. Review the seven forms of energy and their meanings

1. Mechanical - movement
2. Radiant - light
3. Chemical - burning, change in molecular structure
4. Electrical - flow of electrons
5. Nuclear - splitting of atoms
6. Thermal - heat
7. Sound - noise

B. Ask the students if they think energy can move. We know that it does because we can feel heat move from the heating unit from which it is being emitted to where we are. A light beam from a flashlight shines on something a distance away.

C. We know that energy moves. How does it know where to move? Use several examples of things moving from an area of greater to lesser. Heat does the same thing. It moves from where it is warm to where it is cold, from where there is a lot of heat to where there is little heat.

D. How do you get heat energy into your house? The furnace, the biggest energy user in the house, warms the air and forces it into the rooms. That is if you have a forced air furnace.

E. This lesson is designed to give the students tips on how they can help prevent the wasteful use of heat evergy at home. Besides energy, what else is saved by using less heat? (Money)

II. Seven energy saving tips

A. Tell the students a story about something that has happened to most everybody at sometime or another.

> "It's a very cold day. You come into the house after school. Your mother is in another room. What is the first thing she asks you about what you remembered to do? (Close the door) Why did she ask you that?"

Go over to the door in the kitchen and open it. Have the students notice the space created by the open door. What is the first thing the warm air in this room is going to do? (Go through the open space) Why? (Because warm air moves into cold areas) What is the first thing you can do to save heat in your home?

REMEMBER TO CLOSE THE DOOR - Tip #1

B. Share a second story with the students.

> "You and your family are sitting in the living room or family room watching T.V. and someone says, 'Gee, it's cold in here!' What do you do?"

(Allow the students to give several responses. One of the first suggestions they often make is to go to the thermostat and turn it up.) The room gets warm and you are comfortable. What else gets warm? (Other rooms) Who is in those other rooms? (No one) Is it a waste then to heat up the air in the other rooms? What would be a better thing to do? (Put on more clothes, put a blanket around you, even newspaper will keep you warm.)

DRESS APPROPRIATELY. WEAR SEVERAL LAYERS OF CLOTHING. (Two sweaters are worth a 5° lower setting.) - Tip #2

C. If the furnace is the greatest user of energy in the home, what do you think is the second greatest user of energy? (The hot water heater) For what do we use hot water? (Wash clothes, wash dishes, bath water, etc.) When you take a shower or bath, let's see what happens with the heat energy from the hot water heater. First a shower - the water has been heated through the use of energy. You let the energy heated water flow from the showerhead over your shoulders down to your toes and then where does the energy go? Right down the drain! You are throwing both money and energy down the drain. What could you do to lessen the amount of energy that goes down the drain? (Allow the students to give several answers) A five minute shower is all that is necessary to enable you to get clean.

TAKE SHORT SHOWERS - Tip #3

Baths waste more water than a five minute shower would because it takes more water to fill up the tub. How deep do you think you should fill the tub? (Use your pointer finger as a measuring stick) The water doesn't need to be any deeper than the length of your pointer finger. You can also keep the benefit of the warmth of the water by not letting it go down the drain right away. It can be used to warm the room.

D. The last three tips are free ones. The next three are inexpensive.

Most of us have holes in our houses of which we are not aware. Do you know how to find them? Try the quarter test. (Use the yellow door model with the door sweep that is sitting on one of the cross pieces of the Insulation Demonstration Display.) If you can fit the edge of a quarter between the door and its frame, you have a hole equivalent to a six inch diameter circle.. A door measures 19 feet around the edge. You'd fix a 19 foot crack in the wall. You can also fix it around your door. But how? You want to use a stripping to keep the weather out. What is it called? (Weather stripping)

Use the two yellow door models to show the students the different types of weather stripping.

one door model
1. Door sweep - at bottom and on inside of door
2. Vinyl and metal piece on side - put on outside, wears a long time
3. Foam material on inside edge of frame

other door model
4. Metal stripping - very common. It is worn when it begins to ripple.
5. Vinyl threshold cover enclosed in metal

Check the weather stripping periodically. It wears out and needs to be replaced.

CHECK DOOR WEATHER STRIPPING - Tip #4

E. Besides around the doors, where else might you have a hole in your house? How many of you have light switches and receptacles on outside walls of your house? What is behind them? (Use the Outlet Insulation Demonstration Panel. Take off the light switch cover plate with the gasket attached to it.) If it's windy, you can feel the wind coming in. How can you plug up the hole? (Allow for several suggestions stressing dangers if there are any.)

Foam gaskets can be purchased at a hardware store and are an inexpensive way of plugging up a hole behind the light switch plates and receptacle plates on outside walls. Think about the safety of installing the gaskets, however. The electricity should be turned off to prevent an accident while the gaskets are being installed.

INSTALL GASKETS OR SOMETHING SIMILAR TO FILL IN HOLES AROUND SWITCH PLATES ON OUTSIDE WALLS - Tip #5

F. There are places where you can't put weather stripping or gaskets. What do you put in these cracks around the foundation of the house, the corners, window sills, window frames, outside vent systems, etc.? (Caulking) Caulking can be used to seal off areas that don't have to move. Weather stripping must be used to seal off areas around objects that have to move.

CAULK CRACKS THAT NEED TO BE SEALED - Tip #6

G. What do you think is the most expensive way of containing the heat within your house? (Insulation) How much should you use and what types are available?

Use the Insulation Demonstration Display to show the students different kinds of insulation. Turn the wall type structures around until the insulation is visible. Use the fiber glass bats first. Tell the students the following information.

Notice that on the outside of the bats are letters and numbers. The letter R refers to the ability the particular insulation has to resist heat. The number next to the R denotes the R-value. One of the bats has an R-value of 11 and the other an R-value of 19. To have an R-value of 11, the insulation is 3 1/2 inches thick. The R-19 insulation is 6 inches thick. The thickness of the insulation needed to supply various R-values varies from product to product.

Insulation does not have to be in bat form. It can also be loose and blown into spaces like the attic or walls that have already been constructed without insulation having been put in previously. These types of loose insulation shown here are rock wool, a by-product from the processing of iron ore, and cellulose which is made out of ground up newspapers treated with a fire retardant.

Present codes suggest that enough insulation be installed to allow for the following R-values.

Ceilings	R-38
Walls	R-18
Floors	R-19

Why do you think the ceiling requires the most insulation? (Heat rises and will move out of the living space of the house if it is not contained)

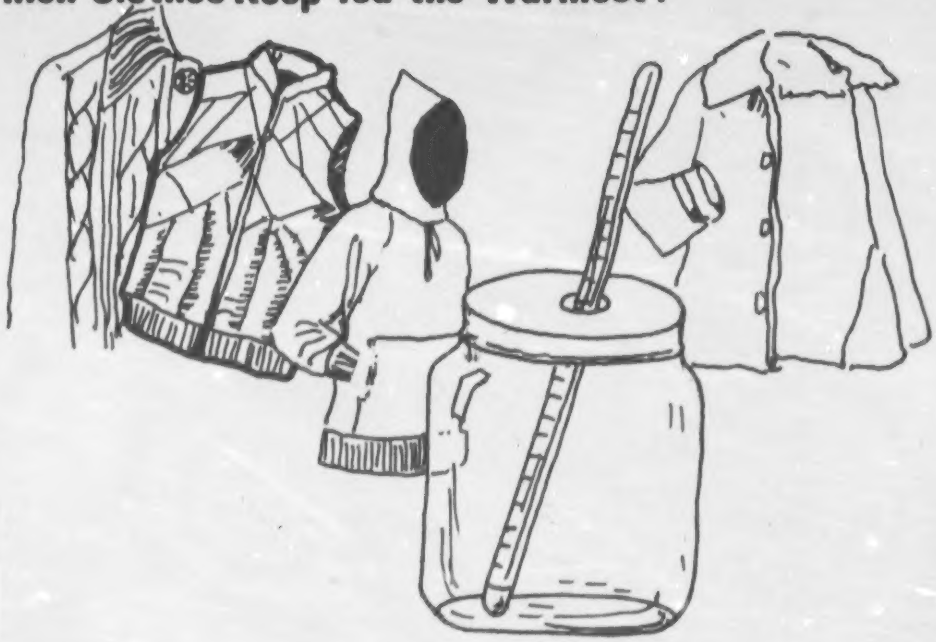
INSULATE YOUR HOUSE - Tip #7

Another item which can be insulated is a hot water heater. Newer hot water heaters have built in insulation. Older models might lose heat to the outside because of lack of adequate insulation. Water heater jackets can be placed on the outside of uninsulated water heaters.

III. Evaluation

Review the seven energy saving tips with the students. You might like to make a game out of the lesson by having the student memorize each point (tip) as it is made and then quiz them periodically as you go through the lesson. For instance, after discussing tip #5 you might ask: What was tip #1? or What was tip #3? We have found that the students remember all of the points when they have been put into a game format.

Which Clothes Keep You the Warmest?



Instructions:

Different types of cloth have differing insulative abilities. The following activity should help students become aware of which materials will keep them the warmest or coolest.

1. Select old clothes from thrift shops, Salvation Army stores, or rag bag.
2. Cut swatches of cloth to cover the sides and bottom of a jar (baby food, jelly, etc.).
3. Make a hole in the lid of the jar large enough to insert a thermometer. Cover the lid with the same material used on the sides and bottom of the jar being sure to leave a hole for the thermometer.
4. Use a jar that has not been covered as a control unit.
5. Fill the jars with warm water. Insert the thermometers and record the temperature of the water.
6. Continue to record the temperature every ten minutes for as long as you think is necessary. (Children who cannot read

thermometers can note the movement of the temperature indicator).

7. A graph might be made from the collected data.
8. Process the activity by having the students note which materials are better insulators than others.
9. You might wish to extend the activity by allowing the students to experiment with several layers of material covering the jars simulating the way people dress during cold weather.
10. Have the students analyze their own clothing and consider which of their clothes would be most suitable to wear during the different seasons.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Energy Saving Tips - Clothing

Layers of clothing are more effective protection against cold than a single layer of heavy clothing. Insulating air is trapped by the layers and warmed by body heat.

Dressing in layers makes it relatively easy to add and take off clothing when activities decrease or increase.

Layers should be thought of in terms of their functions.

1. The layer next to the body should be a fabric that absorbs moisture and helps it evaporate from the skin to maximize skin comfort. Lightweight, porous fabric with an open weave is best. Examples of clothing are underwear, cotton socks, pant liners, blouses, shirts.
2. The insulating layer is next but can be several layers providing extra insulation. The escaping body heat is held in dead air spaces between the body and the layer(s) of clothing. Loosely-woven fabrics from loosely-twisted yarns that are thick, resilient and absorbent are good insulators; examples are fur and fleece; high-bulk man-made acrylic fibers; filling type materials such as down and fiber fill; thick fabrics such as quilted material, textured knits, thermal knits; napped fabrics such as corduroy, velvet and velour; and nubby fabrics like tweeds and terry cloth. Types of clothing include blouses, skirts, shirts, slacks, thermal underwear, sweaters, woolen socks.
3. A protecting layer is worn to keep cold, moist, drafty air from penetrating into the insulating layer. High twist yarns, close weaves and smooth finishes are desirable characteristics in protective fabrics; examples are natural leathers, vinyls, man-made fibers such as polyester and polyester-cotton blends, nylon, acrylic acetate. Types of clothing include shoes, coats, sweaters, blazers, shawls and robes.

Certain fibers, the types of fabric construction, color of the garment, design, fit and cleanliness all help determine whether a layer is effective.

1. Dark colors absorb light and convert it to heat; light colors reflect light and are cooler.
2. Tight fitting clothes affect blood circulation thus inhibiting warmth from spreading through the body.
3. For maximum warmth clothing should be close-fitting at ankles, wrists, and neck. This minimizes heat loss.
4. For warmth these features help: fitted waistlines, long straight skirts, straight-legged pants, long fitted sleeves, vests, turtle necks, leotards, panty hose, opaque hose and thick socks.
5. Clean clothes are warmer. Garments lose insulating value when air spaces are clogged with dirt.

The insulating value of clothing can be reduced up to 90% when the garment gets wet.

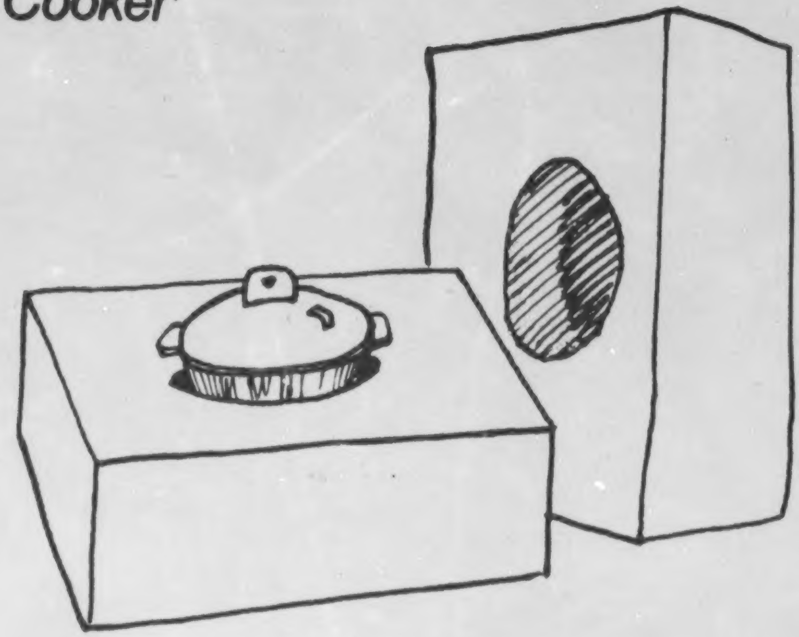
Even when the rest of the body is covered, up to 90% of a person's body heat can be lost through an uncovered head. Tightly-woven or knitted wool or cotton head coverings are the warmest.

Woolen mittens are best for hands since they aren't tight and hold the fingers together loosely. If gloves are worn, they should be lined with wool, synthetic pile or fur.

Feet should be protected by shoes and boots with linings, thick soles and heels.

Source: Kansas State University
Department of Clothing & Textiles

Fireless Cooker



Instructions:

The fireless, insulated cooker is a means of conserving the heat of cooking foods. When food is heated thoroughly, the heat can be retained for a number of hours by placing the kettle in the fireless cooker. The kettle should be well filled with food. Once you close the cooker, it is best to keep it closed for a few hours because every time you open it you lose heat. Some foods will take longer to cook. In this case, remove the kettle after a few hours, reheat and return it to the cooker. Food should not be allowed to become cool in the fireless cooker. After removing the kettle, let the cooker remain open for 2-3 hours to dry out.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

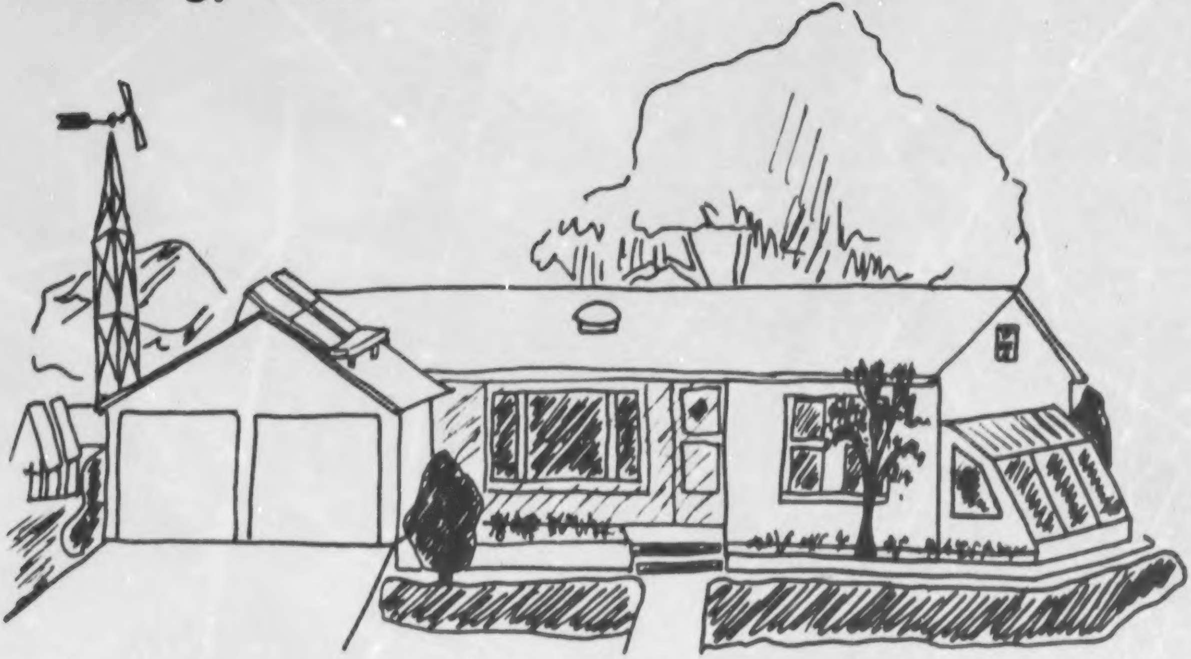
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Energy Place



Instructions:

This energy program has been operated by the City of Wichita Energy Office since 1975. The two bedroom 1,100 sq. ft. home has been completely retrofitted with insulation in the attic, walls and floors. One by one different heating and cooling systems were added and tested for their effectiveness and slowly the home began to function as a model of energy efficiency. The role of the "Test Facility" then became one of demonstration, public information and technical assistance and changed its name to The Energy Place. The Energy Place, as it became known in 1979, houses a number of conservation measures and devices while also utilizing alternate forms of energy. Solar collectors, various wind systems, woodburning stoves and a solar greenhouse are some of the displays the public can see during a tour of The Energy Place. Pamphlets and many publications are available to the public, as well as an extensive energy resource library. Workshops and special projects are also part of The Energy Place program.

Energy Place

Energy Tour

This map will guide you along the energy tour and point out displays located throughout. Each guidepost describes the display at that location. You are invited to visit and take the energy tour for ideas to help you conserve energy. Just ask the staff for maps, literature and assistance. The Energy Place is open to the public from 9 a.m to 4 p.m., Monday through Friday.

Address:

City of Wichita
Energy Place
1602 South McLean Boulevard
Wichita, KS 67213
Telephone: (316) 265-4193

Which of the following questions could be answered with this activity?

1. What is energy doing?

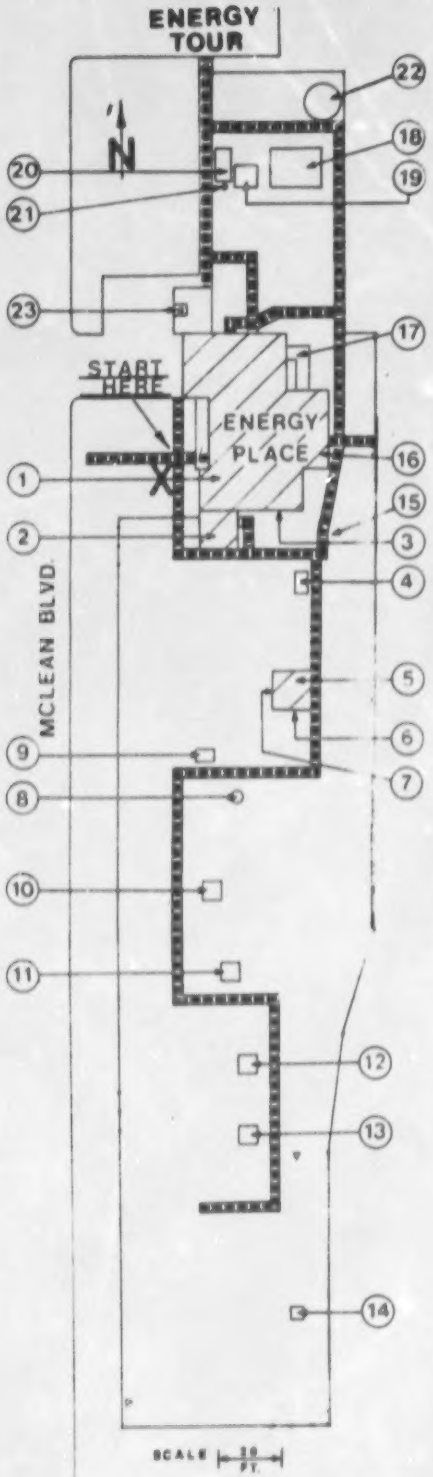
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Energy Place


ENERGY TOUR
N
START HERE
ENERGY PLACE
MCLEAN BLVD.
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
SCALE 20 FT.

DISPLAYS

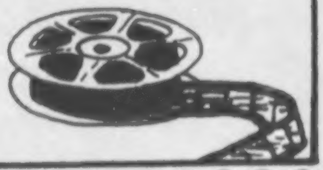
1. The Energy Place
2. Passive Solar Greenhouse
3. Vertical Solar Air Heater
4. Solar Window Furnace and Food Dehydrator
5. Test Building
6. Trombe Wall
7. Energy Efficient Replacement Windows
8. Alcohol Still
9. Savonius Rotor
10. BTU Bungalow
11. Batch Hot Water Heater
12. Solar Dog House
13. Solar Cooking Oven
14. Enertech 4000
15. Wood Heating
16. Vinyl & Steel Siding
17. Air Conditioners
18. Solar Air Collectors
19. 200 W. Wind Charger
20. Sun Bank Collector
21. Photovoltaic Cells
22. Solar Concentrator
23. Water Well

Wichita Energy Office

PRESENTS

Saving Energy at Home

No. 1725 13 min.



Instructions:

This film will help the students:

1. Become aware that energy in the home is taken for granted.
2. Have an awarness that good information and careful use can cut home energy consumption in half.
3. Identify many energy consuming items in the home and how to improve them.
4. Develop a new attitude about saving energy.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

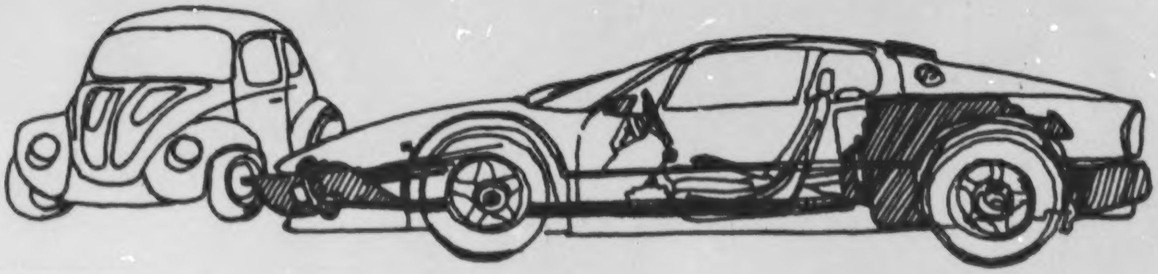
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Car Conception Criteria



Instructions:

1. Have the students make a list of what they think they will want on the first car that they'll be driving.
2. Next sort the list of items into two categories labeled "needs" and "luxuries."
3. After this discuss why they feel each particular item is a need/luxury.
4. As a conclusion, discuss an energy-efficient car in relation to the energy situation, using supplemental materials such as Tips for Energy Savers, Gas Mileage Guide - EPA Fuel Economy Estimates, magazine ads, television commercials, and literature from various dealerships.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

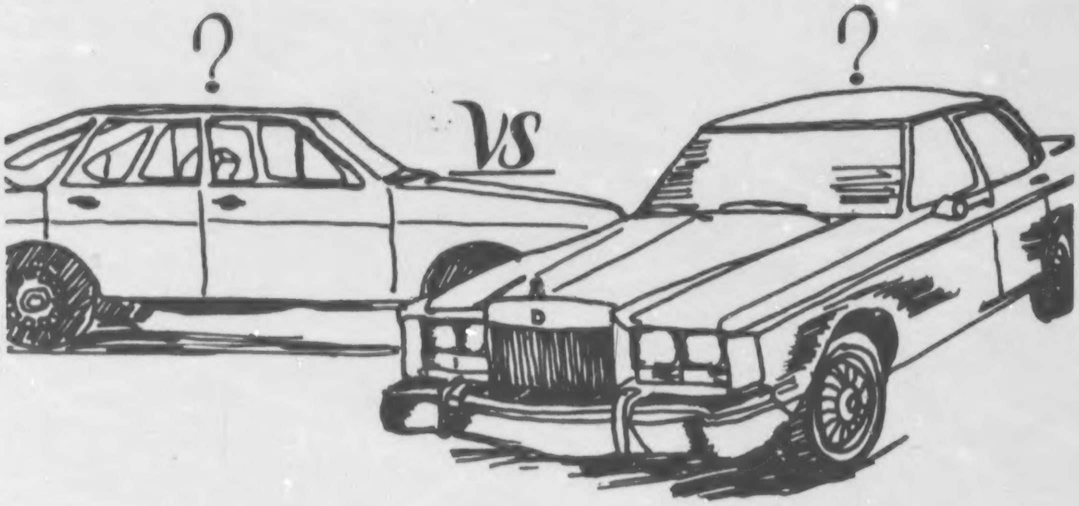
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Gas Mileage



Instructions:

To determine gas mileage, fill up your car with gas and record the mileage from the odometer. This will be called the "1st fill-up". Drive your car as you normally do until the gas gauge is at 1/4 tank or less. Fill your tank a second time and record the mileage ("2nd fill-up"), and also record the number of gallons of gas it takes to fill the tank. Subtract the first mileage from the second mileage. Divide the number of miles travelled by the gallons of gas in the second fill-up. How did your car do?

Step 1: 2nd fill-up _____ miles minus 1st fill-up _____ miles equals ______ miles travelled

Step 2: ______ miles travelled divided by _____ gallons of gas (2nd fill-up) equals _____ miles per gallon of gas

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

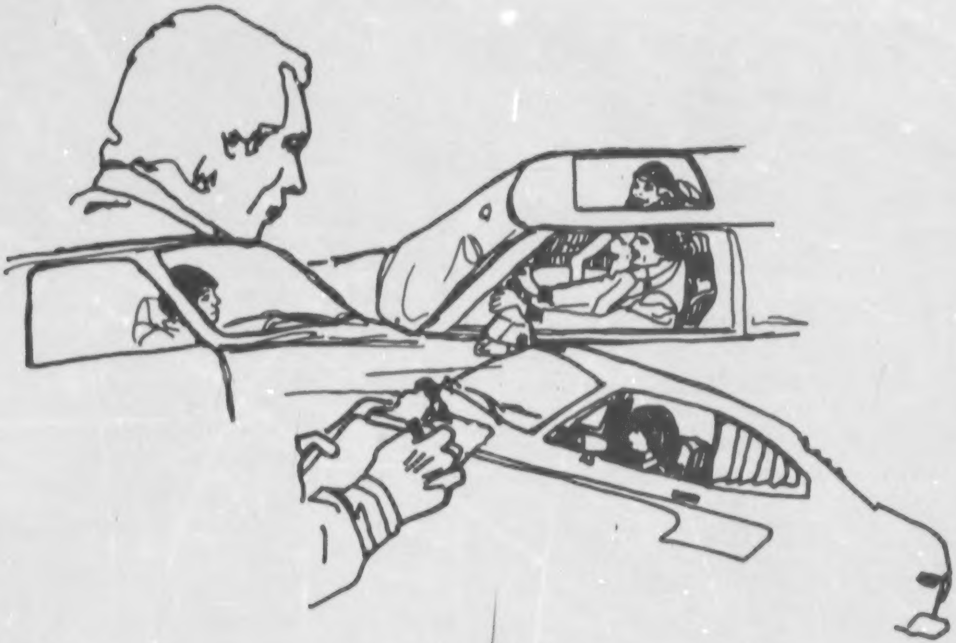
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Traffic Count



Instructions:

Two participants go to a heavily travelled street. One person calls out the number of occupants in each vehicle that passes by while the other person records the numbers on a clipboard. Note the time of day, location of street, and type of vehicle.

After you have this information, you can:

1. Find the average number of occupants in each vehicle.
2. Obtain EPA statistics.
3. Compare passenger miles per gallon of gas.

Some questions that might be asked of the students are:

1. What does this information suggest?
2. How can this situation be improved?
3. What other suggestions do you have?

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

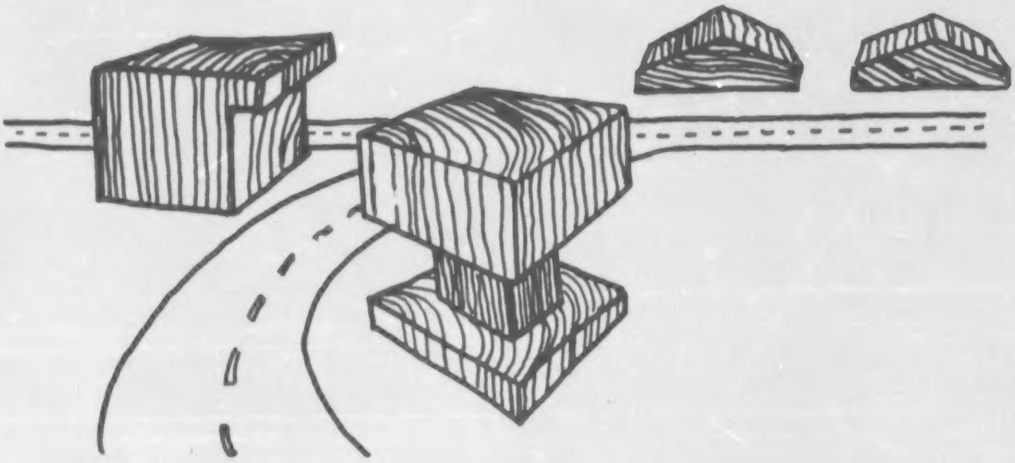
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Model City



Instructions:
In the Social Studies lab at the Energy Adventure Center, we have a grid laid out on the floor covering a 15 foot square area. It has streets, highways, a railroad track, a river and an airport. We also have wooden structures representing businesses and homes. Using the grid and the buildings, students develop model cities and discuss the transportation problems associated with their cities just as they are associated with real cities.

Many activities may be developed from this general plan. What suggestions do you have?

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

MODEL CITY EXERCISE

Directions: (1) With your house as the starting point, figure the distance in miles to each of the other places. (2) Next, multiply your answer by two. This will give you the round trip mileage. (3) Then multiply your answer by twenty cents. This will give you the cost per mile.

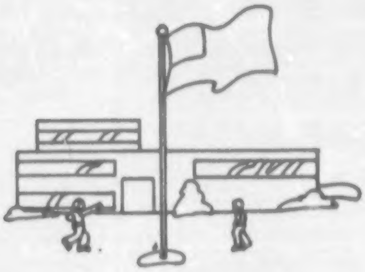
YOUR TOWN

SHOPPING CENTER

TOWN MALL
BANK

1. ______________________
2. ______________________
3. ______________________

YOUR SCHOOL



1. ______________________
2. ______________________
3. ______________________

YOUR HOUSE

PARENT'S PLACE OF BUSINESS

Advance
INDUSTRIES

1. ______________________
2. ______________________
3. ______________________

FAVORITE RESTAURANT

1. ______________________
2. ______________________
3. ______________________

FRIEND'S HOUSE

1. ______________________
2. ______________________
3. ______________________

MODEL CITY EXERCISE

1. Pick from the box one business building and place it on the city. Do this until all businesses are located.
2. Choose a location in the city for your home.
3. Use your pencil and write on the back side of this sheet. Make a list of places you travel by car with your family during a normal week of activities. (Examples: grocery shopping, shopping for clothes, visiting relatives, church, movies, scouts, etc.) Write down at least five, more if possible.
    a. Estimate the number of miles round trip (to go and return) and write that distance alongside each trip.
    b. Add the mileage for a weekly total.
    c. Compare your total with the other members of the group.
4. What energy problems do you see as you view the model city? List them.
    a.
    b.
    c.
    d.
5. Do you (or members of your family) make choices about some of these problems? (Circle one) YES NO
6. You have noted some of the energy-related problems that occur in cities. How would you change or make different choices? List them.
    a.
    b.
    c.
    d.
    e.
7. Share your observations with the rest of the group.

Model Cities

Objectives: Students will review basic concepts in the settlement patterns of communities in the United States.

Students will become aware of the increased use of fossil fuels for heating, manufacturing and transportation during the last century.

Students will analyze their own use of fossil fuel for transportation.

Students will lay out a community on the floor map that is energy efficient in its use of fossil fuel for transportation.

Students will analyze the energy efficiency of the community they have developed.

Materials needed: Map laid out on the floor of A-2; box of wooden houses and businesses, and chalkboard (See diagrams #1 and #2 for information to put on chalkboard.)

I. Introduction

A. To begin our lesson, let's consider how cities and communities use fossil fuels today.

1. Review the nonrenewable fossil fuels - coal, oil, natural gas.

2. What are some ways cities use nonrenewable fossil fuels today?

    a. Manufacturing
    b. Transportation
    c. Heating and cooling homes and businesses
    d. Street lighting
    e. Maintenance of public property
    f. Etc.

3. Review the renewable fuels - solar, wind, water, wood and geothermal.

4. What are some ways cities use renewable resources today? (It is difficult to come up with suggestions for this one, for we do not use the renewable resources to do the work for us to the extent that we use the nonrenewable resources.)

II. Development of communities

A. Let's go back in history to the time when Wichita was first being settled. (Ask the students to create a mental picture of Cowtown or any other early settlement.)

1. How did people come to this area of the country? (Horseback, horse and wagon, walk) What type of energy did these means of transportation require? (Food) How do people travel to

Wichita today? (Car, bus, plane) Have the energy needs changed? (Yes) How? (We need gasoline made from a fossil fuel-oil-to operate our means of transportation today.)

2. What three things were needed by all people in order to survive? (Use the chalkboard area "Basic Needs" to record the answers as the students suggest them. They are: food/water, shelter, and clothing.) These needs influenced where people settled. What place would most nearly meet the needs of the people? (An area close to a water source) What would be available to them by the water?

   (a. Good land on which to grow food
   b. Water for drinking, cooking, washing, transportation, irrigating crops
   c. Wood for heating, cooking, constructing shelters
   d. Animals for food and skins for clothing)

   Where would a place like this be in Wichita? (Along the Arkansas River. Show where that would be on the floor map.)

B. As communities developed and more and more people moved into the area, towns were established that resemble Cowtown. Streets were laid out, homes and businesses were built. Picture the streets and buildings of Cowtown. How were they different from the ones we see today? (Raised wooden sidewalk, not cement ones; unpaved streets; buildings were very small and located close to each other.)

1. Use the following questions to elicit answers from the students to complete the chart on the chalkboard for the year 1870. Put the responses on the chalkboard as students suggest them.

   a. How did people get from place to place? (Walked, rode a horse, used a buggy pulled by a horse)
   b. What kind of energy was used by those forms of transportation? (Food)
   c. What fuel did people use to heat their homes? (Wood, cowchips, etc.)
   d. What fuel did they use to manufacture their goods? (Food, if goods were made by hand; coal, if goods were made by hand in a blacksmith's shop, etc.)
   e. Which of the three areas - heating, transportation, manufacturing - required the use of fossil fuels as an energy source in 1870? (Manufacturing) Would you suppose as much fossil fuel was used in that area in 1870 as is used today? Why or why not?

C. As the years passed, more and more people moved to towns. More and more streets were built and the towns spread out. (Show the students the black lines on the floor map that represent streets. Tell the students that by 1900 the town wouldn't have spread out the whole distance represented on the floor map, but to a certain distance beyond the river.) Forms of mass transportation were developed - a large enclosed wagon pulled by horses, trolley cars, etc. Then the car was invented. (As the students answer your questions, put their responses on the chalkboard under the 1900 areas.)

1. What sources of energy were used for transportation in 1900? (Food for horses, gasoline made from oil for cars)
2. People were beginning to use furnaces in their homes that burned a solid fuel. What was it? (Coal)
3. Larger factories were being built. What fuels would be used to operate the machine? (Coal was burned to boil water creating steam. The steam made the machines operational.)
4. What have you noticed about the use of fossil fuels in these three areas in comparison to how much was used in 1870? (More fossil fuels were being used in 1900.) Why do you think this is so? (They made man's work easier. People thought that new inventions made the quality of their life better.)
5. Do you think as much fossil fuel was used in 1900 as is used today? Why or why not? (The answer to the first question should be no for various reasons. People didn't own as many things in 1900 as we do today. They didn't travel as far or as often. There are many other answers.)

D. By 1980 Wichita had spread outward from the inner city. One would have to travel many miles to go from the city limit at the north end of the city to that of the south end or from the city limit at the east side of the city to that of the west side. (Put the students' answers to your questions on the chalkboard under the 1980 areas.)

1. What source of energy is used to power our means of transportation in the 1980's? (Gasoline - a refined petroleum product)
2. What source of energy heats our homes? (Natural gas or electricity generated from natural gas here in Wichita)
3. What source of energy do we use in our factories for manufacturing? (Natural gas)

III. Analyzing a community's use of transportation

A. Let's consider our lives in Wichita today.

1. Suggest five places you go sometime during the week. Do not include home. (List the students' responses under the section of the chalkboard labeled "Places We Go Every Week".)
2. Suggest ways you get to the places you wish to go. (List the students' responses under the section of the chalkboard labeled "How We Get There".)
    a. A typical list of ways of getting places is: walk, car, bicycle, skateboard, van, motorcycle, skate, bus, taxi.

3. Rank order the list of transportation items from the least user of fossil fuel.

   a. The list should be rank ordered approximately this way.

      1) walk
      6) car
      2) bicycle
      2) skateboard
      4) van
      5) motorcycle
      2) skate
      3) bus
      7) taxi

   b. The rank ordering of this list assumes that each means of transportation is being used to capacity, passengerwise.

   c. Although the bicycle, skateboard and skates don't require any fossil fuel to make them operational, they do require the use of fossil fuel in the manufacturing of them.

IV. Use of the floor map

   A. Pretend that you have been asked as a group of city planners to develop a new community. The one requirement is that it be designed so that it is energy efficient transportationwise.

   B. The straight black lines represent the areas for development.

   C. (Make sure that each student has a business and a house from the box of wooden pieces. If there are not enough pieces so that each student can have a home and a business perhaps a pair of students could share a house and a business. It is our hope that all students will participate in this activity thus they all need access to at least one wooden piece.)

   D. Establish the distance between intersections.

   E. Have the students place their wooden pieces on the floor map keeping in mind that they are to:

      1. Work as a group of city planners
      2. Create a community that uses very little fossil fuel energy (Gasoline) for transportation.

V. Processing the activity

   A. After the students have designed their community, discuss with them why they chose the pattern that they did.

   B. Discuss the transportation options they might have for going to and from work or to other places of business.

   C. Discuss whether they have been successful in executing their task of creating an energy efficient community. Perhaps the students would wish to rearrange their community to make it even more energy efficient.

Model Cities - Diagram #1

(To be put on the chalkboard)

Basic Needs	Places We Go Every Week	How We Get There
1.		
2.		
3.		

Fuel for Heating

1870 -

1900 -

1980 -

Fuel for Transportation

1870 -

1900 -

1980 -

Fuel for Manufacturing

1870 -

1900 -

1980 -

Model Cities - Diagram #2 (Answer Sheet)

(To be put on chalkboard)

Basic Needs	Places We Go Every Week	How We Get There
1. Food/Water	Answers will vary	Answers will vary
2. Clothing		
3. Shelter		

Fuel for Heating

1870 - Wood

1900 - Coal

1980 - Natural Gas

Fuel for Transportation

1870 - Food (for horses and man)

1900 - Food, Oil (gasoline)

1980 - Oil (gasoline)

Fuel for Manufacturing

1870 - Wood, Coal

1900 - Coal

1980 - Natural Gas

Metropolitan Transit Authority

Instructions:

One of the three main users of energy is transportation. One of the most energy efficient ways of travel is by bus.

A speaker from the Metropolitan Transit Authority is available to come to the classroom to work with students. The speaker will help the students:

1. Read and understand a bus schedule.
2. Learn how to signal the driver to stop the bus.
3. Use tokens and money to ride the bus.
4. See the advantage of buying a punch card rather than individual tickets.
5. Learn the essentials of how to ride a bus.
6. Understand the role mass transit can play in saving energy.

If you would like to have the MTA speaker come to the classroom and/or would like to arrange a trip to ride the bus, please contact the MTA office at 265-7221.

Which of the following questions could be answered with this activity?

1. What is energy doing?

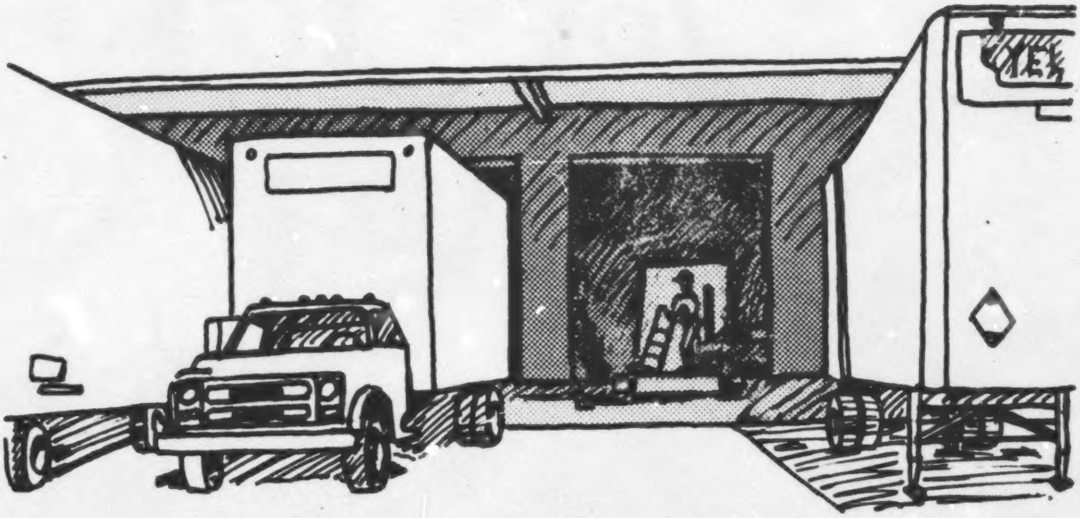
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

The Fleming Company



Instructions:

The Fleming Company of Wichita is one of the major food distributors in the southern half of Kansas. They deal with virtually every kind of item found in modern supermarkets.

A tour of Fleming exposes students and teachers to the operation of a warehouse where foods are stored before being distributed to the IGA stores. The tour guide will speak directly to energy usage in the warehouse if the teacher stresses an interest in it. Teachers and students will observe how energy is used in the transportation of and storage of food items.

Address:

Fleming Foods Company
Bill Newport
3600 North Santa Fe
Wichita, KS 67219
Telephone: (316)-838-3311 or
(316)-832-5778

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

The Fleming Company

Purpose:

The transportation of goods is a vital link in the process of production and consumption in the United States. This field experience will help students to better understand the problems involved in the transportation and storage of goods. It is used to emphasize the resulting uses of energy.

The length of the tour is about one hour. It usually begins in an immense area stacked with boxes full of goods. The goods are categorized and stored according to computer numbers. This enables the workers to quickly locate the items during loading and unloading. This loading and unloading area has room for many semi-trailer trucks to park. The guide may take the students into the back of a truck. He explains the refrigeration procedures and how different temperatures are maintained within the same trailer.

Towmotors (electric powered fork-lifts) are used to move the goods in and out of the truck and from place to place in the warehouse. There are several rows of battery chargers which must be used every night to insure that the Towmotors will function properly. At this point, energy use is already very evident. Chemical energy to fuel the trucks and electrical energy to power the Towmotors.

"Perishable" goods such as fruits, vegetables, meats, frozen foods, and candy require a lower storage temperature than "non-perishable" goods. The fruit and vegetable area is noticeably cooler than the general storage area. A relatively constant temperature must be maintained for proper freshness. For some particular fruits, this is especially crucial. Bananas, for example, are received totally green and must be ripened at the warehouse. This is done in rooms made solely for that purpose. Ethylene gas is blown into the rooms and a pre-determined temperature is maintained for a designated period of time.

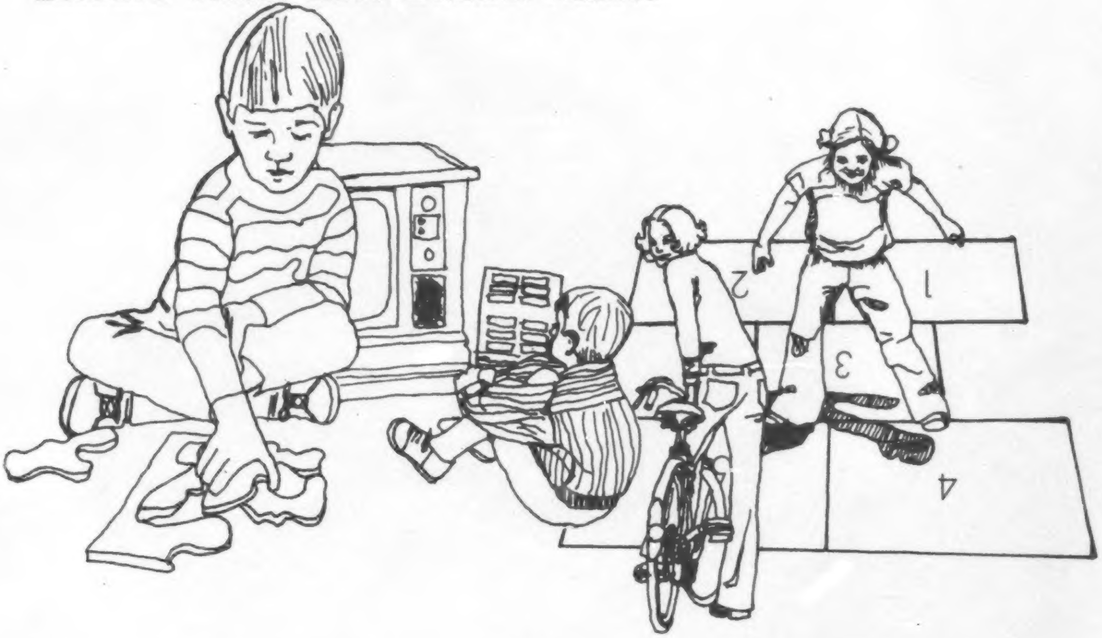
Meats and dairy products require a still colder temperature. As the students move into this area they are again reminded of the energy required to cool such large areas. The frozen food area is visited for a short while only. Very low temperatures here!

The office area is generally the last stop on the tour. The computer index system is the primary focus here. Even the inventory system requires energy.

Possible questions:

1. How does this use of energy make your life easier?
2. What energy must be used before these products get to you?
3. What could you do to save energy in this process?
4. How does the food get from the manufacturer or producer to the warehouse?
5. What are the advantages and disadvantages of this warehouse?
6. Could this work be done without the machinery?
   If so, what would this mean to you as a consumer?

Leisure Time / Recreational Habits



This autobiographical questionaire is used to determine how your leisure time and recreational habits are related to energy usage.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Leisure Time / Recreational Habits

1. Name ______________________________
2. Age ______________________________
3. How do you spend your leisure time? (Include interests, hobbies, etc.)

   ____________ ____________
   ____________ ____________
   ____________ ____________

4. What forms of energy do you use in your leisure time activities? (Examples: watching TV - electrical, reading - mechanical)

   ____
   ____
   ____

5. What resources of energy do you use in your leisure time activities? (Examples: watching TV - oil, coal, natural gas--anything used to generate electricity; jogging - food)

   ____
   ____
   ____

6. Arrange the list of things you do in your leisure time from the things you do the most amount of time to the things you do the least amount of time.

   Most ________ ________ ________
   ________ ________ ________
   ________ ________ ________
   ________ ________ ________ Least

7. Next to each item in your list in number 6, write the resource of energy used for each.
   Study your completed chart.
8. Write a statement that shows your awareness of the amount of your own energy as compared to other resources of

energy you use in leisure time activities.

____

____

9. Put a check mark next to the following recreational activities in which you participate. Fill in as many "Others" as you can.

________ reading a book
________ swimming
________ going to the movies
________ playing with friends
________ riding bikes
________ bowling
________ skiing
________ going to a game center
________ skating
________ going on a trip with your parents
________ others ________________
____
____
____

10. Analyze each of the recreational activities in which you participate and the energy resource used for each.

Activity	Energy Used
________________________	________________________
________________________	________________________
________________________	________________________
________________________	________________________
________________________	________________________
________________________	________________________
________________________	________________________
________________________	________________________
________________________	________________________
________________________	________________________
________________________	________________________

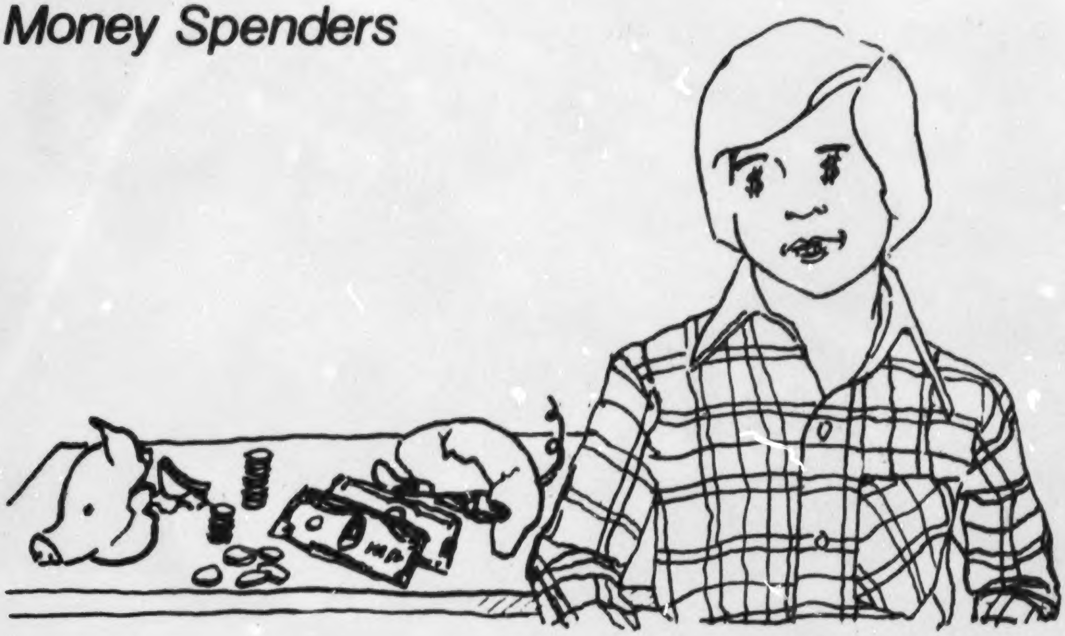
Leisure Time/Recreational Habits

11. Write a statement that shows your awareness of the energy that is used in your recreational activities.

12. What did you learn about your use of energy by doing this questionaire?

13. Did you learn something new about yourself that you weren't aware of before? If so, what was it?

Money Spenders



Instructions:

This autobiographical questionaire will help you determine your money sources, how you use it, and how these relate to energy usage.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Money Spenders

1. Name ______________________________
2. Age ______________________________
3. Do you receive some kind of an allowance at home? ______
   - A. Weekly ______________
   - B. Monthly ______________
   - C. Other ______________
4. Do you receive this for various jobs you do at home? ____
5. Are you employed outside the home? ____________________
6. Do you have some kind of a savings account/checking account in which you deposit this money? ______________
7. Do you spend all your money? ______________________________
8. On what do you spend your money?

   ______________ ______________ ______________

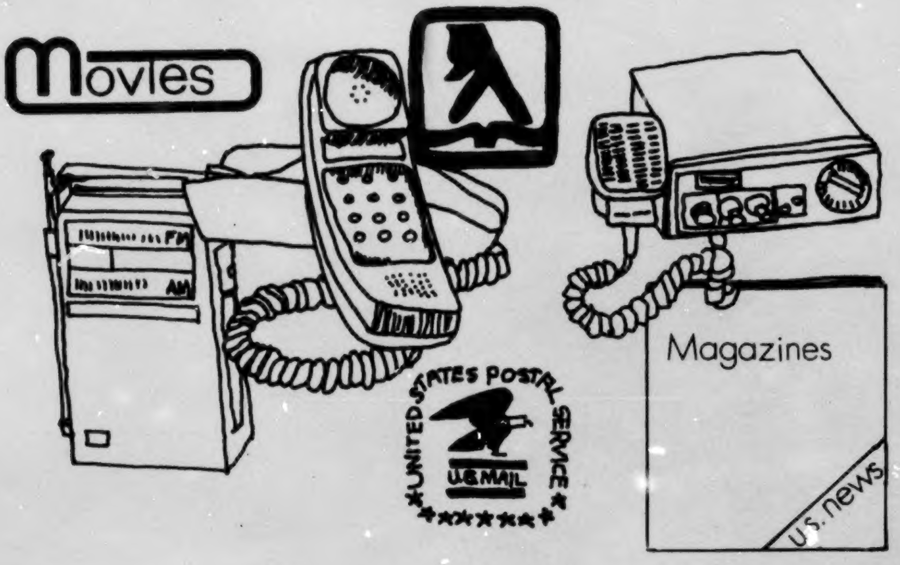
   ______________ ______________ ______________

   ______________ ______________ ______________

   ______________ ______________ ______________

9. Do any of the things you listed in number 8 require the use of energy in the manufacturing of the item or in the use of the item? If energy has to be used, put a check (✓) next to the item. Be prepared to tell your teacher what resource of energy is used.
10. Do you spend your money for things you need, for things you want, or for both? ______________________________
11. What have you learned about your money saving or spending habits and their relationship to energy usage from filling out this questionaire?
12. Did you learn something new about yourself? ____________
    If so, what new thing did you learn: ____________________
    ____
    ____

Communications


Movies
FM
AM
UNITED STATES POSTAL SERVICE
U.S. MAIL
Magazines
U.S. news

Instructions:

This autobiographical questionaire will help students determine which types of communication they use and their relationship to energy usage.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Communications

1. Name ____________________
2. Age ____________________
3. What are some of the methods of communication you use today to send messages or information?

   ____________ ____________ ____________

   ____________ ____________ ____________

4. What are some of the methods of communication you use to receive information?

   ____________ ____________ ____________

   ____________ ____________ ____________

5. Consider each method of communication you named in #3 and #4. What resources of energy does each require either to be sent or to be received? (Example: mail delivery--gasoline for transportation of mail locally and across the country, gasoline for transporting you to the post office, fossil fuels in the factories where stationery is made or printing is done, etc.) Be as complete as you can for each.

   ____

   ____

   ____

   ____

   ____

6. Do you read magazines? ________________

   Do you buy them at stores? ____________

   Are they delivered to your home? ________

7. Do these magazines influence your lifestyle (clothes you wear, food you eat, places you go, etc.)? __________

   In what way do they influence your personal use of energy?

   ____

   ____

   ____

8. On the average, how many hours a week do you watch TV?

____

9. Do the programs you watch or the commercials you see influence your lifestyle? ______________________________

In what way do they influence your personal use of energy?

____

10. On the average, how many movies do you go to see each month?

____

What resources of energy do the films and you, going to see the film, require? ______________________________

____

11. On the average, how many books do you read each month?

____

In what ways is energy used in the publication of books?

____

____

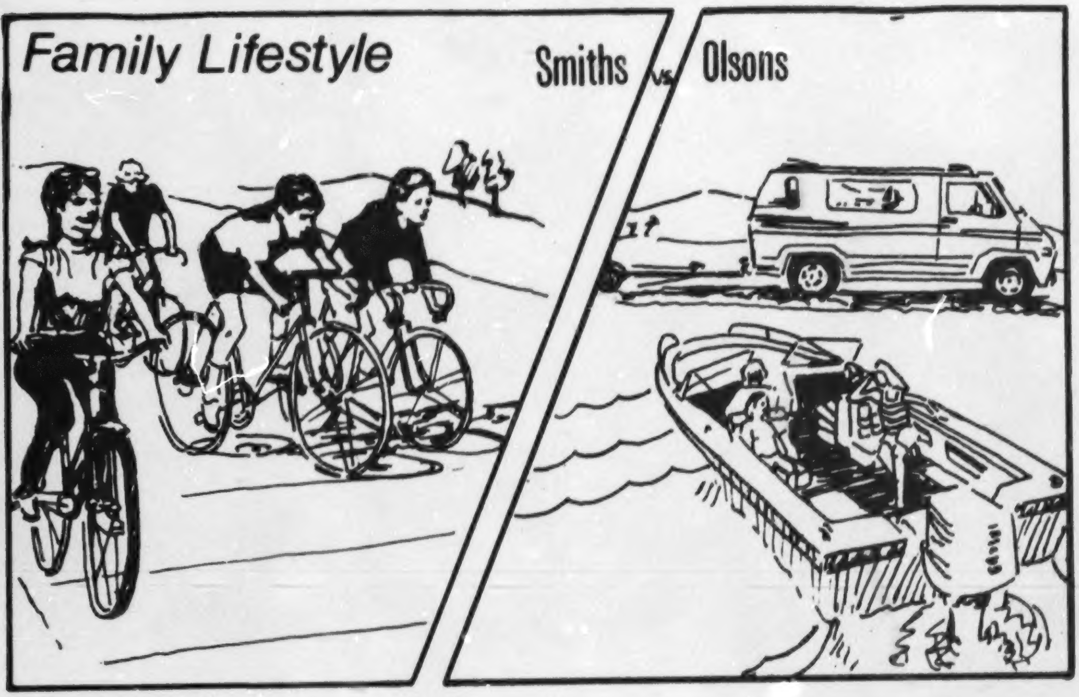
____

12. As you have thought through answers to the previous questions, have you become more aware of how energy is used in various methods of communication? ______________

13. What new thing did you learn about yourself by answering this questionaire? ______________________________

____

____



Instructions:

We would like you to meet two families--the Olsons and the Smiths. Pretend they have invited you to visit their homes in order to become acquainted with them. After reading the brief description of the two families, write a paper telling how these lifestyles vary according to their commitment to the energy problem. Later, role play the two families.

The Smiths

The Smiths have realized there is an energy problem for quite sometime. They have made several changes in their lifestyle and home environment because of the growing energy problem. According to the Smiths, the problem is everyone's responsibility and conservation must be practiced by all.

The Olsons

The Olsons believe there really isn't an energy problem. There just isn't much they can do. The problem is the big oil

(continued)

Self Evaluation on Energy

MAYBE
YES
NO

Instructions:

This activity is used to determine energy conservation habits. Circle (Y) for yes, (N) for no, or (M) for maybe.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Self Evaluation on Energy

ARE YOU A PERSON WHO...

Y N M 1. will depend on a car for the majority of your transportation?

Y N M 2. will wear warmer clothes in the winter and keep the thermostat lower?

Y N M 3. will insist on an electric or gas clothes dryer when you have your own home?

Y N M 4. keeps shades drawn on the windows in the summer to help keep it cool?

Y N M 5. turns off the lights whenever you leave the room?

Y N M 6. will continue to recycle even though others make fun of you?

Y N M 7. tells others to conserve energy?

Y N M 8. turns the radio or TV on soon after you get into the house?

Y N M 9. talks a great deal about our energy shortage but keeps using all your appliances?

Y N M 10. believes we will be giving up "the good life" if we cut our use of energy?

Y N M 11. is likely to become increasingly active in energy conservation?

Energy Concern

Instructions:

We become well informed about energy by reading, learning, interviewing, and discussing. When we see something wrong, most of us want to try to correct it. Sometimes we don't do anything because we don't know what action to take. This activity tells about some of the ways other people have gotten desired changes.

Put an "X" by any you have done and a "✓" by those you would consider doing. Then do one or more of them, or one of your own.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Energy Concern

WRITE A LETTER

_____ 1. Write a letter to the editor of your local newspaper.

_____ 2. Write a letter to your congressmen or senators about a problem which you are concerned about or compliment them for some action they have taken.

_____ 3. Send a letter to someone in the news who has done something you respect or admire.

ATTEND A MEETING OR ORGANIZE ONE

_____ 4. Write one of the organizations working for a cause you believe in and ask to be put on their mailing list.

_____ 5. Ask your own club or church group to have a meeting and invite a guest speaker to discuss a topic you are concerned about.

TAKE PART IN SOME ACTION

_____ 6. Organize a petition drive.

_____ 7. Volunteer to work in a campaign.

_____ 8. Wear a button.

ONE-TO-ONE ACTION

_____ 9. Speak up for your point of view.

_____10. Try to get someone to read an article or pamphlet which argues for a different position than the one he/she holds.

_____11. Try to close the gap between what you say you believe and what you do. Let your life be a living argument for what you believe.

OTHER

_____12.

_____13.

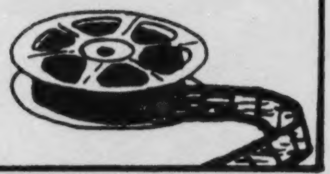
_____14.

EAC

PRESENTS

A Matter of Choices

No. 1142 22 min.



Instructions:

This film will help the students:

1. Have an awareness of the basic energy sources we depend on.
2. Discuss how our attitudes and values along with technological forces have increased our demand for energy.
3. Begin to realize what can happen if we don't conserve our use of energy.
4. Understand we must begin to make choices.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

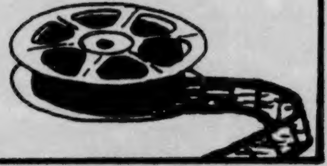
4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

PRESENTS

Choice Is Ours

No. 1729 25 min.



Instructions:

This film will help the students:

1. Obtain information in these areas:
    a. population control
    b. food production and processing
    c. pollution in crop production
2. Understand that each area above demands an answer in control or conservation
3. Begin to understand that present conditions still afford us a choice in remeding our problems.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

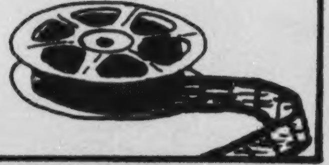
EAC

PRESENTS

Careers in Energy

FSR No. 1231

min.



Instructions:

These filmstrips and cassettes will help the students:

1. See job opportunities in the area of coal, petroleum, and nuclear as well as hydroelectric, solar, wind, and geothermal.
2. See what all is involved in power production.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Extra! Extra! Read All About It!

Energy Times

Instructions:

How would you like to have a newspaper to read in your classroom written by students for students? As your class does energy activities, have them write their experiences and reactions in the form of an article, a joke, a puzzle, a poem, etc. They can share their experiences with other students in your school or another school. Be sure to include the student's name, grade, and school so that students are properly credited.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

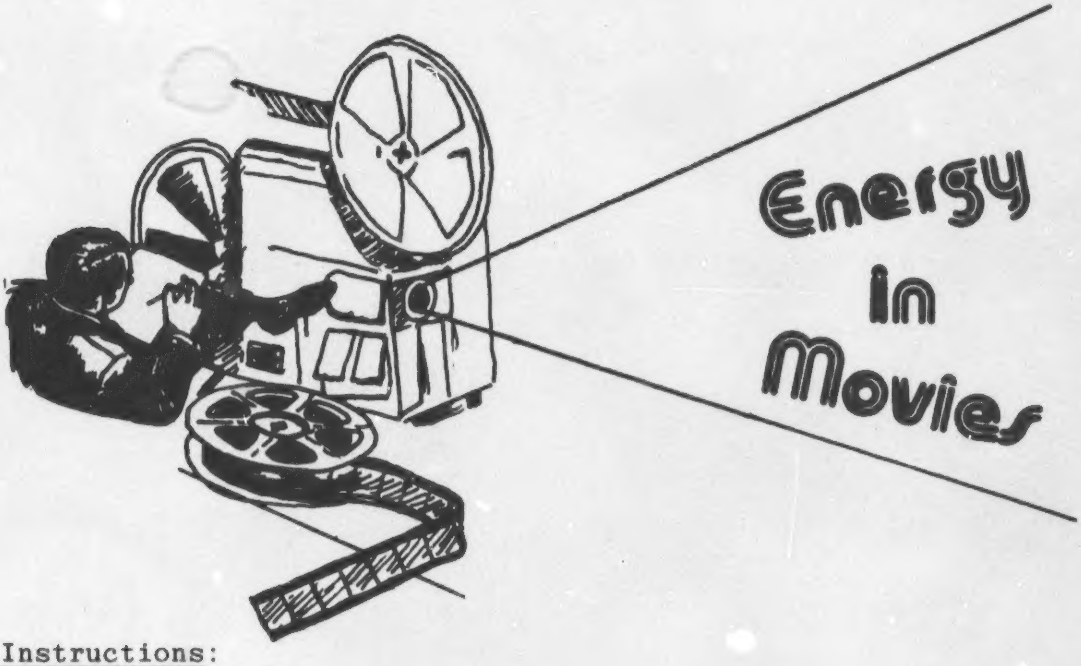
2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Review A Film



Instructions:

Most films will have energy in them. Try to find one that you think would have some good examples and let the students watch the film and look for energy topics. For instance, the children could identify sources or forms of energy that they see in the film.

Notes:

Which of the following questions could be answered with this activity?

1. What is energy doing?

2. What forms are being converted?

3. What resources are being used?

4. What changes could this activity mean for society?

5. How could this activity change the individual's use of energy?

Save Energy Sticker Activities

The following activities have been developed to promote a general awareness among students of energy conservation through the use of Save Energy stickers. We hope that the students will use the stickers in an appropriate way. It is not our intention to have them used indiscriminately resulting in the defacing of the environment - public or private.

1. Much energy is wasted because we forget to turn off a light, the TV, the stereo or other energy consuming items when we leave a room. Perhaps your students would like to take several Save Energy stickers home and with the approval of their parents put the stickers on the energy using items they are likely to leave on when the items aren't being used. The sticker hopefully will remind the family members to turn off the energy consuming item and thus save energy.

2. Pac-Man is very popular these days. Perhaps your students would like to add a few details to the stickers with magic markers to make them resemble the Pac-Man figure. The stickers could be placed on light switches to show how Pac-Man would save energy (gobble up wastefulness) by turning out the lights. Your students could suggest other ways energy could be saved and apply the stickers to the item. Turning off the lights at school is an obvious way of saving energy but students should be aware that the wise use of paper towels, notepaper, pencils, crayons, etc. also saves energy.

3. Construct a bulletin board entitled "Using Energy." Illustrate or cut out two pictures - one showing the misuse and the other showing the wise use of energy in a situation. Put the "Save Energy" sticker on the picture in the pair that shows energy being used wisely.

   Examples:
   a. A car with one person and a car with several people in it.
   b. A thermostat set at 72° and a thermostat set at 78° for airconditioner setting.
   c. A child riding a bike or walking to a game and a child being driven to the game in a car.
   d. A picture of someone turning up a thermostat to warm the house and a picture of someone putting on more clothing to keep warm.

4. A class might work with the school custodian to investigate ways to save energy throughout the school. Signs could be made to tell how energy is saved and placed in appropriate locations around the school - near light switches, near water fountains (refrigerated ones especially), in work areas, in the boiler room, etc. Save Energy stickers could be affixed to the signs.

5. Create a class story. Instead of writing the words Save Energy in the story, put a Save Energy sticker in its place.

6. Construct an Energy Savers task chart. Brainstorm with the students all of the ways they think that they can save energy at school. The chart should contain the names of all of the students and the ideas that were suggested by the students.

Example:

	Turn off lights	Wear appropriate clothing to stay cool or warm	Use paper wisely
John C.			
Mary D.			
Ellen M.			
Jack P.			

When you assess as a class which of the energy saving ideas each student has utilized, a Save Energy sticker could be placed next to the student's name under the correct heading.

7. Make Energy Saver buttons. Have the students design buttons they can wear on their blouses or shirts. The buttons should show how they save energy. A Save Energy sticker could be affixed to the button.

8. Hold a schoolwide campaign to save energy. Design awards that can be given out to all students (or classrooms) as they make an effort to save energy. Put a Save Energy sticker on each award.